Shiv Visvanathan

A Carnival for Science

Essays on Science, Technology and Development

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A Carnival for Science

My childhood in the fifties was something beautiful. India was a livable world. India, industrial India, was both cosy nest and future nest-egg. We were simultaneously profound, naïve, innocent and sophisticated. It was a world where Gandhi and Nehru were heroes, and Raj Kapoor and R.K. Narayan the story-tellers. Life was part *Glimpses of World History*, part *Swami and His Friends* and was peopled by C.V. Raman, Mushtaq Ali, Sarvepalli Radhakrishnan and Dhyan Chand. It was a period of great experiments called Non-Alignment, Mixed Economy and Import Substitution—crystalline terms which look muddled now. At one level it was a world without shadows. We felt that the idea of the third world was invented for us to lead it. We were both modern and uniquely civilizational. We had a copyright on both the past and the future. But what we were proudest of was our democracy, which we repeatedly said was the largest in the world. We knew then that it was both a largeness of numbers and of heart.

As our republic grew towards what Americans called adolescence, strange things happened. India lost a war to China and in my mind it was as bad as when India lost in hockey to Pakistan. Defeat had made the world a dismally serious place. Over the next two decades came a cascade of events—Naxalbari, gheraos, the Emergency, communal riots, Bangladesh, police encounters—and the world we knew started disappearing by the eighties. Statesmen gave way to politicians and our narratives changed from story-telling to social science. Yet despite riots, despite famines and the Emergency, we somehow clung to the one myth, the one assumption that none of us would give up: our self-image as a democracy. But we soon realized that it was a world different from that of our children.

I remember the first time my wife told our eldest daughter the story of Gandhi and the education inspector who asked him to spell kettle. We were touched by the story and his honesty in not cheating. When Meera heard the story, she looked blank and then said, 'It is ok papa, I *know* how to spell kettle'. The magic of Gandhi seemed distant. We were happy that we still shared some of the same people. She loves Raj Kapoor and thinks *Mera Joota hai Japani* is shades better as an anthem than Tagore's song, though she still stands starched and proud when *Jana gana mana* is played. She asks us difficult questions. The other day she said; 'If the Mandal report is for people, why are you against it?' She looks upset when children burn themselves and couldn't sleep the day saffron flagged men screamed late at night near our house. Nearby there is a colony where there is a children's Shiv Sena and it intrigues her.

The most adventurous boy in her class is a Sikh called Angad. He climbs walls effortlessly. Our daughter asks: if Angad is a Sikh, how can Sikhs be terrorists? She is puzzled by Red Alerts and the new Frankenstein called Liberation Tigers of Tamil Eelam (LTTE). Hers is still the innocence of childhood. She is Syrian Christian and Hindu, Tamil and Malayali and, depending on which grandmother she is with, vegetarian and non-vegetarian.

Yet the world she has inherited is different: different in quality of violence, different in the sanctity given to certain words. One can't brush it away with an Alice-in-Wonderland certainty and say, 'I use words to mean what I say'. The words we valued in our time have become rusty and pompous. Sometimes they have become antonyms of their original meanings. Like pedantic parents we make a list of such key words. The magical words of our childhood were nation, science, secularism, development, reason, progress. Yet all these words have lost their fire. If democracy is to be sustained we must revitalize the dialogue around these words. The older notion of democracy which relied on this thesaurus of words won't do. They need to be defined and redefined through continuous conversation.

Consider the fate of only one word, *nation*. It involved freedom and the liberation of communities finding an identity beyond their differences. Nationalists like Gandhi, Nehru, Azad, Patel, C.R. Das, Lajpat Rai, Subramanya Bharati were household names. In a nationalist movement, or so we thought, the suppressed voice of millions came alive and the leaders articulated the voice of these communities. National movements had shades of the carnivalesque; they overturned authority, and ridiculed those who imitated the colonialists.

But as the nation became the *nation-state*, something got bureaucratized. What had been a vision, a living language, froze into a dead grammar. What had been a mosaic, collage, a celebration, a conversation, became a dull boarding school where the state, like a stern principal, ordained what it was to be nationalist. Those who dissented, instead of being celebrated, became anti-nationalist. So Jayaprakash Narayan was anti-national. Anyone who talked of police atrocities or campaigned against dams or nuclear energy was anti-national. If the nation was open and polyphonic, the nation-state was a strait-jacket.

The corset tightened as the nation-state became a *national security state*. Unity became uniformity and the celebration that was India became a dull regime. The old words *swadeshi* and *swaraj* were forgotten. The nation was no longer a cultural identity; it became a military one, suppressing differences beyond and within itself. As a result, the nation as a rubric of multiple identities was truncated. Once you could affably be Bengali or Tamil *and* nationalist. When Satyajit Ray described himself primarily as Bengali, no one became hysterical. Identity was a nested series which spiralled out.

But today identity is becoming aridly singular. You can be Indian in a narrow sense or you become that hyphenated bastardized Hindu-nationalist or Bengali-nationalist. Such a branding destroys the niches which the older concept of nation gave to other identities. It was an identity of a different sort. To put it simplistically, the earlier one rarely said 'Hindu' or 'Indian'. One claimed to be a Vadama or a Tamil without denying the great whole of which one was a part. As a result the larger identity was never reduced to a single integer. Secondly, what was a comfortable separateness never became separatism. N. Laldenga could be a rebel and yet graduate to be a chief minister. Now, the Sikh who was proud of being Sikh and Indian is punished for being both. As a result nationalist power and ethnic violence meet in a mutuality of terror, and terror is the end of dialogue.

The nation-state, instead of being a site for multiple identities, has become a binary entity built on the either/or of Sikh or Indian, Muslim or Indian, disorder or order. Earlier nations had frontiers where identities merged, where lines were porous. Today nation-states have boundaries, reified lines which get drawn across real communities. And then the violence that begins as an act of boundary maintenance moves to the centre. The Naga we killed in the fifties yielded to,or was rather joined by, the Sikh we killed in Delhi in the eighties. The nation which began as an act of liberation has turned genocidal of its own members. The possibilities of democracy declined as terror and body counts became the language of security-as-technocratic machismo.

Science had an even more pathetic fate. In the fifties it was like a magic wand. No nation-state felt complete unless it had both a flag and a science policy document. One still remembers the romanticism of Jawaharlal Nehru's vision of science.[1] For Nehru, the tryst with destiny was a rendezvous with the modern industrial world and 'the future', he proclaimed, 'belongs to those who made friends with science'. During the seventies and eighties we proudly talked about 'the scientific temper', as if it was a vaccine that would immunize us from all forms of superstition. Even during the debates about the Ayodhya crisis, M.R. Srinivasan, the nuclear scientist, proclaimed in *Business India* that the demolition at Ayodhya would not have occurred if we were more scientific. For this generation, dams and laboratories were literally the temples of India, and there was deep pride that India had the third largest pool of scientific talent in the world. But behind it all was a feeling that our scientists were not working at first order levels of creativity. Hossannahs to Nobel laureates Chandrasekhar and Khorana, both émigrés, only emphasized the mediocrity of the rest.

This problem was posed in a fascinating way by Atma Ram. This scientist, who began as an unpaid panboy in a sugar factory and then went on to become chairman of the National Committee on Science and Technology, never wrote his autobiography. But in a set of oral reminiscences he asked again and again, 'Why is it that science in independent India, despite all the investments in it, is not the potentially creative force it threatened to be during the nationalist period?' He then provided part of the answer. He confessed that the Nehruvian dream was to make India win Olympic medals in science: 'We really believed that Nobels in science went hand in glove with rise in GNP.' He then added that it was a race in which we will always be poor thirds, or at best glorified seconds. It is a phenomenon which has been dubbed the P.T. Usha syndrome, a glorification of competent athletes who almost made it to the bronze medal in the Olympics. Even here the list of the glorious ones is miserably short.

It was one of Atma Ram's major critics, the science policy expert and a superb raconteur, A. Rahman, who provided another part of the answer, although he was talking not of science, but about hockey. India used to be champions for decades. Legends of great players like Dhyan Chand and Roop Singh can bring nostalgic joy to fans. At one time the English and the Germans used to collect film clips of our hockey stars. Today India is thinking of importing coaches and is even grateful for a few tips from the Australian, Ric Charlesworth. Rahman said, 'Hockey is no longer hockey. They have changed the rules of the game.' Remember the 1936 Olympics when Adolph Hitler was touting the myth of Aryan supremacy? We began playing in shoes which we were not used to. We took them off and breathed and played like ourselves. India beat USA 24-1.

Then they changed things. They changed the ground on which we played. It was not grass, flat earth with its unexpected variety and playfulness, a field that called for immense skill. It became astroturf. It was no longer dribbling skill but speed that counted. There was no place for minuets, no appreciation of the diversity of skills. There was only emphasis on power, stamina and speed. Even the perception of the body changed. 'Oriental' skill and wizardry were being replaced by occidental power and mastery. What facilitated this was also the change in rules, particularly the sticks rule. Very soon our 2-3-5 combination, the essence of Indian play, was altered to suit the western style of speed. Hockey was no longer hockey.

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[1] See Baldev Singh (ed.), *Jawaharlal Nehru on Science and Society: A Collection of His Writings and Speeches* (Delhi: Nehru Memorial Museum & Library, 1980). Nehru's essay on dams in this volume, his comments on gigantism reveal afterthoughts to his earlier view of industry.

One has an intuitive feeling that this fable of hockey is relevant to science, that we will always be a poor third because we do not understand the rules of the game, that we need to restate them in terms of our native genius. But there is an even more worrying fact. Many of our technological programmes which had begun with the best of intentions had ended in the destruction of our civil rights.

The project on dams has resulted in the creation of over a million refugees. The nuclear energy complex used seasonal workers to repair dangerous leaks and then abandoned them. Intellectuals like Dhirendra Sharma were regarded as being anti-national for criticizing our nuclear programme. The havoc caused by 'progressive' family and urban planning programmes is well known. We are once again being threatened by a forest bill that in effect seeks to destroy the life-support systems of thousands of tribes and peasants. This sense of irony pervades science, and the tragedy is our scientists fail to see it. Beyond this, there is a general feeling that underlying modernity was the social contract between the nation-state and modern western science and both were engaged in a soap opera called development. This process was becoming life threatening and even genocidal.

In the history of the last two decades four events arose to expose the futility of this regime. The first was the declaration of Emergency in 1977, the second, the so-called 'November riots' in 1984, the third, the Bhopal gas disaster and the fourth event was the drama around the building of the Narmada dam. These four events not only provide a rorschach for our generation, they are a litmus test of our positions on democracy.

The declaration of the Emergency by Indira Gandhi was not only a suspension of fundamental rights. It marked a significant crisis for a development regime tired of the inability of slums and peasants to enter clock time. The regime saw the diversity of India

as recalcitrance. This is embodied best in the career of Jagmohan, Vice Chairman of the Delhi Development Authority and later Lt.-Governor of Delhi.

For Jagmohan, and for many other bureaucrats during the Emergency, the poor in the slums were brakes on progress. Legally they were viewed as squatters, 'hygienically' they became carriers of virus, of disease, requiring the strong hand of the state to purge, cleanse and renovate them. In a revealing poem that he wrote, Jagmohan confessed:

I know
I am no genius
No Haussmann reborn
No Lutyens with a chance
Or Corbusier with Nehru's arms...[2]

This dedicated bureaucrat saw in the Emergency (and in Sanjay Gandhi) the moment of his technocratic dreams, his own self-admitted realization of Haussmannism. Haussmannism can be defined as an act, whereby a mechanical scheme—a plan for a city, a factory or a dam—is imposed on a culture without any consideration for the traditions of the community. The term derives from the activities of the French planner, Baron Haussmann, who imposed a mechanical grid of roads on Paris after the Commune. In Haussmannism, the technocrat is the leviathan imposing the flatland of mechanical order on the varieties of tradition of nature. The demolitions all over Delhi were attempts to erase the slums and visually cleanse the city. The technocratic impetus is obvious in the writings of the man. He stated that slum-clearance was a technological act transcending politics. He claimed that 'what has been bulldozed is not the slums but their politics, not the *jhuggi-jhompries* but the physical and mental diseases they reared. Bulldozers are instruments of development not of demolition.'[3]

To the technocratic bias of the Emergency state one has to add the logic of a 'triage' model. The rituals of the laboratory state view the poor, the marginal, the squatter, the migrant simultaneously as

[2] Jagmohan, *Island of Truth* (Delhi: Vikas Publishing House), 1978, p.10.

[3] Ibid., p.71.

an object of development and as dispensable. He is paradoxically both the unit of progress and the index of retardation. One sees the logic of this in the family-planning programme. Family planning involved both technique and massification. It legitimized all sorts of measures against vagrants and slum dwellers in order to provide the statistical index of progress that the technocratic state requires. Let us not forget that the two figures deeply associated with environmentalism were also the two deeply implicated in the Emergency. I am referring to Jagmohan and Indira Gandhi.

During the Emergency, it was the slums that were both the object of demolition and family planning. Ironically those who wanted allotments to slums in the outer rings of Delhi had often to produce sterilization certificates. The Haussmannism of the imperial Lutyens received a lumpenic twist in the hands of the Emergency bureaucrats. Old communities were disrupted and forced to the margins of the city. The process of rehabilitation was inevitably and understandably slow. What was far more important was that in these areas the old sense of community was destroyed. There was little or no interaction between various groups in the new context. It was from these margins of the city that the Congress party recruited the crowds for its rallies. It was these very same lumpens who could be recruited to attack any community, indifferent as to identity of the victim.

The Haussmannism of the Emergency received a further twist during the so-called November riots of 1984, when at least 5000 Sikhs were murdered during the aftermath of Indira Gandhi's assassination. It was from the outer sector of Delhi that the worst excesses of the November riots came.

The riots were a state-sponsored exercise. As a result the notion of the state as protector of the community became increasingly ironic yet difficult to dislodge. The first reactions of many, even those who had been predicting such trends, was to appeal to the state. Genocide for reasons of state was something they had not come to terms with. Repeatedly one expected the state to move immediately to enforce control, to establish relief camps, to facilitate rehabilitation and to guarantee justice. One expected leaders to express some sense of horror and atonement for what had been done. The power of the Gandhian hunger fast has, however, been lost on his bastard epigoni. Even when relief measures were promised, they were role-playing moves announcing compensation like a publicity-oriented insurance company would.

This brings us to another pertinent point regarding the prevailing interpretation encouraged by the state and by many members of the majority community. The riot is seen as retribution, restoring order to the polity. The violence is first seen as an act of restoring a presumed imbalance. To it is added something more complex. This is the notion that as a catastrophe it was natural, not man-made. This was best reflected in the discussion on compensation. The compensation offered was nominal. Human beings and material objects were both treated as 'resources' lost. When appeals for increased compensation were made, the bureaucratic reply was, 'If we do so, people affected by floods might ask for more'.

When genocide becomes 'natural', one confronts the real logic of a terrorist state. This violence, which was at the margin for years, had moved cognitively to the centre. Geographically, it had spread from repression of tribals in border states to the capital. The Sikh, the Naga and the insulated academic-intellectual had become one, as siblings in prospective terror. The terrorist state seems to have decided that they were all dispensable, either for being too weak or too different, reminding one again of the doctrine of 'triage'. Intellectual, religious or economic autonomy is today at a discount.

The Bhopal gas disaster of 2 and 3, December 1984 added a third twist to the tale. What Bhopal underlined was the enormous incompetence of both the state and the professions. It was because of this that the victims of the disaster are an embarrassment to the India of the twenty-first century. Let me elaborate.

The modern state claims competence in both warfare and welfare. The state claims not only a monopoly of the means of violence but also an overall oligarchy of expertise. Both war and well-being require the services of the professional expert. The history of the Indian state has been the history of its great commissions and each of these commissions has helped extend the professional control of the state. One can cite the litany of reports—the Industrial Commission Report of 1916 to the Royal Commission on

Labour, the reports of the National Planning Committee, the Bhore Committee Report, the Kothari Report on Education and the Science Policy Resolution. Each of these reports has legitimized the entry of the state into new domains by offering claims to professional expertise.[4]

There has been an implicit social contract between the state and the professions in their common pursuit of welfare, development and modernity. What Bhopal did was to expose these claims to competence as spurious, questioning both the competence and the ethics of the professional expert. Firstly, all scientific information on the disaster produced by the laboratories was deemed secret. No official scientist objected publicly to this. Science, rather than being 'public knowledge', was declared a closed book. One never knew whether scientists were hiding behind their ignorance or their esotericism. The government of India appropriated the right to fight the case on behalf of all the victims and yet it did not compile even the basic statistics of death, damage and property loss. The doctors too generally dismissed the complaints of most victims as 'poverty-induced malingering'. Dissenting professionals like Hiresh Chandra, Sujit Das or Anil Sadgopal were brushed aside by the state.

When, along with the victims, voluntary groups jumped into this void, the state felt doubly threatened. Not only was the victim finding a voice, he was challenging the expertise of the professions and the state. The agencies of civil society were literally creating a counterculture of 'counter-experts'. For a brief while there was a festival of voluntarism, a carnival of counter-experts initiated by groups like the Medico-Friends Circle, the Voluntary Health Association, the Bhopal Group for Information and Action, the Morcha. It was raucous, quarrelsome, anarchic personalized talk, which fused fact and value and abrogated the divorce between observer and observed. The professionalized state watched this with embarrassment while these groups operated clinics, conducted surveys, promised People's Science Institutes. The effervescence of this anarchy could not last but its message did. It demonstrated that the state–professional nexus was a disabling one. It is this period

of suspicion that the verdict brought to an abrupt end. The verdict which accepted that Union Carbide was not criminally responsible restored the order of modernity truncating the voices of the victims and the voluntary groups. It restored the technocratic order. It removed Bhopal from the domain of controversial politics into that of clear-cut management. Now justice was a mere technical answer to a technical question. The nation's technologists could return to the business of business.

The general feeling was that development must go on. What one needs is not 'fewer projects but safer ones'. But when voluntary groups repeatedly demonstrate the dangers of Kaiga, Narmada, Bhopal, or the new seed policy or the vaccine gun, who listens? The voice of the expert has spoken. Victims are not a part of scientific history or discourse. A society moving towards modernity does not want to give its obsolescent victims a voice. So the people of Bhopal must join the victims of dams and nuclear parks as silent witnesses to development.

Finally, the Narmada dam challenged the Nehruvian vision of science and technology. When Nehru claimed dams and laboratories are the temples of modern India, he was merely expanding the idiot visions of August Comte and St Simon. His was only a liberal variant of the Leninist equation that Soviets + electricity = Communism. The history of Stalinism and particularly of Chernobyl proved that Soviets + electricity = genocide. It is not accidental that when the first protests against the Narmada dam took place, the protestors were arrested under Defence of India rules. The dam became a reason of state. Narmada and Bhopal reveal that India has become a part of the risk cultures of the twenty-first century, where a nuclear reactor or a large dam is seen not just as an experiment on a people but as a 'calculated risk'. Such a viewpoint underlines what Hannah Arendt has called the 'banality of evil'. The lives of Baba Amte and Medha Patkar and other activists are desperate efforts to open Narmada as a moral and cognitive space. Even as one writes, the waters are entering the village and people are being forced out of their houses in the name of progress and electricity.

The above tale of events spanning the seventies, eighties and nineties provided the grist to the mill of these essays. They can be

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[4] See Shiv Visvanathan, *Organizing for Science* (Delhi: Oxford University Press, 1985), Chs. 2 & 3.

visualized in three segments. The first essay 'On the Annals of Laboratory State,' argues that development is a scientific project and that it is inherently genocidal. It attempts an analysis of the four key concepts in the genocidal glossary. This essay was my first break with the more official view I held while writing *Organizing for Science*. The essay was written for the *Lokayan Bulletin* special issue, 'On Survival,' and subsequently republished.[5]

The next three essays are attempts to chronicle the major morality plays of modern science. The essay on genetic diversity is a tribute to one of the greatest Russian scientists, Nikolai Vavilov. It was he who captured the problem of diversity, distorted partly by the orbit of hysteria that marked the Lysenko affair. It asks the basic question: how far can science unravel and cope with the issue of diversity. 'Footnotes to Vavilov' was first written for Steven Marglin and Frederique Apffel-Marglin's *Decolonizing Knowledge*.[6] The monologic nature of western science is then caught in the next essay, 'Modern Medicine and its Non-Modern Critics', which is a collaborative piece. The first part on medicine was written by Ashis Nandy, and the chronicle of the pluralistic possibilities of medicine was based on work I originally did as an ICSSR (Indian Council of Social Science Research) Fellow. It was originally published in *Dominating Knowledge*,[7] the first of a series of books which arose from the conversations of a remarkable group of individuals woven together by the Marglins.

The third essay is an attempt to create the sociology of a nuclear regime. It is a textual exercise and is a reading of the works of the remarkable Austrian journalist, the late Robert Jungk. It was Jungk who said that if Shakespeare had written *Hamlet* today, he would have been a scientist. I wrote the essay as an attempt to outline the choreography of positions available to a scientist confronting a nuclear regime. What began as choreography became more of a *danse macabre* as one followed Jungk through the anthropology of the Atom Staat. 'Atomic Physics: The Career of an Imagination', was first published in *Alternatives* and remains my favourite in this collection. It was later published in Nandy's *Science, Hegemony and Violence*.[8]

The next set of essays is more playful and teases the stuffiness of modern science in elliptical ways. The bamboo and the coconut have always fascinated me. I feel whole books can be written about them. I have used the flowering of the bamboo to tell a political fable. 'The House of Bamboo' was written for a festschrift honouring the Indian chemist and sociologist of energy, Amulya Kumar Reddy.

The second essay is an attempt to react to the greatest inventor of this century. Gandhi has always fascinated me not as a catechism but as a playful array of possibilities. In 'Reinventing Gandhi' I attempt something a whole generation of NGOs has wanted to do, rewrite that tantalizing, horribly translated document, *Hind Swaraj*. 'Reinventing Gandhi' was rejected by *Gandhi Marg* and first published in the *IUMDA Newsletter*.

I wish to make one final observation. One must emphasize that the new directions in the philosophy and sociology of science came not from the academia but from the questions raised by grass-roots movements. The grass-roots groups were the dissenting academics of India in the eighties and nineties which raised issues that the universities were reluctant to confront. In their raucous celebration of democracy, these groups attempted to show that the politics of knowledge is an intrinsic part of democratic politics. The works of Vandana Shiva,[9] Sunil Sahasrabuddhey,[10] Claude Alvares[11] or even

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[5] In Ashis Nandy (ed.), *Science, Hegemony and Violence* (Delhi: Oxford University Press, 1988) pp. 257–88.

[6] Steven Marglin and Frederique Apffel-Marglin (eds.), *Decolonizing Knowledge* (Oxford: Clarendon Press, 1996) pp. 306–39.

[7] Steven Marglin and Frederique Apffel-Marglin (eds.), *Dominating Knowledge* (Oxford: Clarendon Press, 1990) pp. 145–84.

[8] Ashis Nandy (ed.), *Science, Hegemony and Violence* (Delhi: Oxford University Press, 1988), pp. 113–66.

[9] Vandana Shiva, *Staying Alive* (Delhi: Kali for Women, 1988).

[10] Sunil Sahasrabuddhey, *Science and Politics* (Delhi: Ashis Publishing House, 1991).

[11] Claude Alvares, *Science, Development and Violence* (Delhi: Oxford University Press, 1992).

Ashis Nandy[12] arose from these situations. As a result these writings have a passion and an immediacy which the more academic works on history and sociology of science lack.

Two other points need to be emphasized. While preoccupied with the locality and the Indian state, these writers felt India was a theatre for a critique of the West. Secondly they concentrated not only on an externalist critique of science *a la* Bernal but added to it an internalist dimension. They tried to understand not only policy frameworks and the political economy of science but also showed how the cosmology within which modern western science was embedded could be a source of violence as well. In doing so they linked questions of cosmology and political economy to democratic theory.

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[12] Ashis Nandy, *Tradition, Tyranny and Utopia* (Delhi: Oxford University Press, 1987).

On the Annals of the Laboratory State

I

Joseph Conrad was one of the great students of modernity-as-violence. In *Nostromo* and *The Heart of Darkness*, he showed how western man had constructed the savage as the Other in order to impose his own savagery on him. The jungle became the theatre of that enactment. Conrad's novel, *The Secret Agent*, is a study of anarchist violence in England at the beginning of the twentieth century. It is an analysis of terrorism-as-faith, an unravelling of the belief that one act of violence can literally erase bourgeois society.

In one of its fascinating passages, the first secretary of the Russian embassy explains the logic of violence to the anarchist, Verolac. He remarks that the power of terror should reside not only in the physical impact of the bomb, but spread further through the aura it creates. An ordinary bombing, he explains, is as banal as class hate:

> But what is one to say to an act of destructive ferocity so absurd as to be incomprehensible, inexplicable, almost unthinkable; in fact, mad? Madness alone is terrifying, inasmuch as you cannot placate it either by threats, persuasion or bribes. Moreover I am a civilized man. I would never dream of directing you to organize a mere butchery. I wouldn't expect from a butchery the result I want. Murder is always with us. The demonstration must be against learning—science. But not every science will do. The attack must have all the shocking senselessness of gratuitous blasphemy ...it would be really telling if one could throw a bomb into pure mathematics ... what do you think of having a go at pure astronomy?[1]

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[1] Joseph Conrad, *The Secret Agent* (Harmondsworth: Penguin, 1980), pp. 36–7.

The secretary asks the agent to blow up the Greenwich observatory, the custodian of time. 'The whole civilized world has heard of Greenwich. The very boot-blacks in the basement of Charing Cross station know something of it.'[2]

Conrad presents the act as a senseless one. He does not explore the possibility that science itself could be a mode of violence or tyranny. He failed to grasp the possibility of a lonely tribal striking a futile blow at Indian Standard Time or at the glass-encased Standard Metre. The anthropology of the act eluded him.

The iconography of the act provides the justification for this essay. It involves, I believe, three separate statements: (1) science could encode a structure of domination and violence; (2) the violence of science is not a pathology confined to the fringes or frontiers such as atomic physics or genetic engineering; it is a pathology which resides in the banality of everydayness; and (3) the act of protest inaugurates what has been called the insurrection of the 'little knowledges'. One must interpret all three statements within the wider framework of the history of science.

I contend that historians of science have been maintaining two parallel sets of registers. There are, first, the textbook histories depicting science as an impersonal method which elevates the idea of order to a collective truth. Accompanying this is an act of bracketing and ritual separation. Theories like racism in anthropology, orientalism in linguistics, IQ in psychology, social Darwinism in political economy and biology, are bracketed off as 'pseudo-sciences' or as distortions of normal science. I suggest an alternative explanation. The marauding genius of science needs these spaces—these 'pseudo-sciences'—for the free play of its imagination. This collective unconsciousness of science constitutes an integral part of the scientific experiment. Marking it off saves science as a phenomenon but contributes little to our understanding of it. It does not explain why these theories so often recur in science.

One can see the same trend in the modern discourse on development. Development should be regarded as a scientific

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[2] Ibid., p. 36.

project. It represents the contemporary rituals of the laboratory state. As a project, it is composed of four theses, ingrained in the logic of western science, of modernity-as-technocracy. One can call them:

1. *The Hobbesian project*, which is the conception of a society based on the scientific method;
2. *The imperatives of progress*, which legitimize the use of social engineering on all those objects defined as backward or retarded;
3. *The vivisectional mandate*, where the 'Other' becomes the object of experiment which, in essence, is violence and in which pain is inflicted in the name of science;
4. *The idea of triage*, combining the concepts of rational experiment, obsolescence, and vivisection—whereby a society, a subculture or a species is labelled as obsolete and condemned to death because rational judgement has deemed it incurable.

Development as a technocratic project includes all four themes. In fact, if concepts could ever be death warrants, the above glossary could be regarded as genocidal. The next sections contain a brief discussion of these concepts.

II

The genealogy of modern science is often traced to the tracts of Bacon and Descartes. They were no doubt influential, but the triptych is only complete with the work of Thomas Hobbes. If Descartes captured the philosophical expertise of the machine as imagination, and Bacon the rules of the experimental method, Hobbes complements them with the conception of a society based on the scientific method. Bacon's scientific utopia, the *Novum Organum*,[3] on which the Royal Society was based, was less grandiose and totalitarian than Hobbes' *Leviathan*,[4] which haunts us to this day. Bacon's conception of Solomon's House was more cautious.

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[3] Published 1620.

[4] Thomas Hobbes, *Leviathan*, ed. Michael Oakeshott (Oxford: Blackwell, 1964).

The Royal Society merely sought a charter for a bounded association within a more encompassing society. The Hobbesian state was a schema for science as society. Both were critiques of the intellectual dominance of Aristotle, but Hobbes' attack was a more mordant one. In fact, the early members of the Royal Society condemned Hobbes for his lack of caution.[5] The Hobbesian project is important because it connects science with power; it links science integrally to the issue of fear, death, terror and violence. The charter of the Royal Society, in which the moment of conception was the moment of fission, is an attempt to wish away this problem. In an open declaration about the dualism of knowledge and power, the charter clearly states that problems of politics are beyond its ken.

For Hobbes modernity demands a move from the state of nature to civil society. His description of the state of nature was not so much a historical account as an analytical one with historical nuances. The state of nature was that of anarchy; a chaos of meanings, emotions, dreams, fantasies and hallucinations. It encapsulated the factionalism of religious strife, the divisive heresy of Levellers, Diggers and other inner-directed groups. Like the society of Hobbes' time, the state of nature was one of rampant disorder where

> every man is enemy of every other man. There is no place for industry, no culture of the earth, no navigation, no instruments for moving, no knowledge of the face of the earth, no account of time, no arts, no letters, no society.[6]

With no science and no society, 'the life of man is solitary, poor, nasty, brutish and short'.[7]

To combat this condition, civil society, which is rational, scientific, stable and ordered, is conceived. The axiom on which rational society is constructed is that the sovereign or the state has the monopoly of terror and of man-made instruments of death. Modernity as society is inaugurated not merely through a contract, but as a theorem, an Euclidean list of propositions which makes

society possible. Science thus colonizes society at the very moment of its inauguration, by conceptualizing it and by policing it. Both the scientist and the sovereign are prior to the Hobbesian polis. Society is based on the violence of the sovereign, but repeated violence makes society uneconomical. To the fear of death is added the structure of quietude, and monolithic order—that is the role of science[8]. The state as the source of ultimate power does not antedate science; it is coterminal with science. In that sense, science is the civics of the Hobbesian world. To be is to be scientific, and to become in every sense of the term a subject and citizen. Science is the grammar of power, and violence of the state becomes a symptom of the breakdown of science. It is in this context that Hobbes examines the problem of sedition.

For Hobbes, sedition is irrational and unscientific. Sedition is any language that does not conform to the rules of science. Included in it are such events as primitive Christianity, Aristotelianism, occult science, and all the other bacchanalia of the mythopoeic imagination. So are all 'fancies, imaginings, passions, expressed in metaphor, poetry, or other imprecise and extravagant modes of speech'.[9] For Hobbes, science provided a mathematical precision of language which made order eternal. The sovereign recedes before the eternal order of science; he becomes a referee, a Hessian Magister Ludi, but one with enormous power.

The Hobbesian project has been the great dream of modern man. It underlies the logic of all technocratic totalitarianism—whether that of Lenin, Stalin or the new laboratory states of the twentieth century. Locke's social theory was merely an attempt to moderate this scientific urge. He posited a distinction between political and scientific communication. Political society, Locke felt, had not reached the clarity of the scientific discourse.

Modern society has oscillated ever since between the Lockean and Hobbesian visions, the movement always being towards recovering the frictionless world of Euclidean politics. The violence of modernity arises not merely from the violence of the state, but from the violence of science seeking to impose its order on society. In fact, through a strange twist, the modern state exists more and more as a big machine guaranteeing the production and reproduction of science. In fact it is the grammar of science that provides for the everyday tyranny of modernity-as-technocracy. I move now to the next concept in our glossary—progress.

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[5] Margery Purver, *The Royal Society: Concept and Creation* (London: Routledge and Kegan Paul, 1967), p. 64.

[6] Ibid., p. 81.

[7] Ibid.

[8] See Norman Jacobsen, *Pride and Solace* (Berkeley: University of California Press, 1978), ch. III, pp. 51–92.

[9] Ibid., p. 89.

III

> I saw them bury a dead child
> In a cardboard box
> (This is true, and I don't forget it)
> On the box there was a stamp.
> 'General Electric Company
> Progress is our Best Product'
>
> – Louis Alfredo Arrago
> Guatemala, 1967

Modernity was a vision of conquest. Every structure of conquest needs a calendar as a liturgy of its power. To acquire one it has to capture or rewrite time. Time, till the advent of modernity, was capable of reversal. Therefore, the first project of modernity and of modern science was to escape from their own pasts, from the traditions of Christianity and Aristotelianism. The medieval cyclical theory of time, which allowed for decadence and reversal, yielded to a linear, irreversible notion of time. The time of modernity became gradually the time of the world. Imperialism was not merely the logic of capitalism but also the charter of science. Bernard-Henri Levy states this succinctly.

> The Greeks did not invent imperialism, because they believed in geography and lived with the illusion that there were scattered and peculiar times, appropriate for each substance and each particular place. The Athenian configuration was not and could not be imperialist in our sense of the word, because its supporters thought time did not exist and that Thebes, Athens and Sparta each had its own chronology, almost like substance. The moderns, on the other hand, were able to invent the idea of empire because they no longer believed in nature or geography, but in infinite, uniform and homogeneous space reduced to a single law of identical temporality.[10]

However, modernity, which had escaped from antiquity, still had to confront the Other—both as other civilizations and the Other-as-tribe. What were these other societies juxtaposed or located along the same, contemporary space? The answer that evolutionary theory gave can be read in the collective representation called the museum.

The museum is an act of classification where artefacts are juxtaposed with each other in a logico-spatial manner.[11] One can witness even today exhibits on technology or cognition arranged in the following way. One 'sees' the primitive canoe or spear. Next to it is arranged the sailing ship or cannon and the exhibits eventually culminate in a submarine or tank. What is a logico-spatial order is then read as time series, where each exhibit is literally seen as evolving into the other. Progress is defined as the ordained linear movement across this sequence.[12] This is the basic assumption underlying the law of stages, present in the work of Auguste Comte (1798–1857), Karl Marx (1818–83), Herbert Spencer (1820–1903) and all the other evolutionary thinkers and scientists.

As a result, other civilizations or tribal cultures are seen as 'contemporary ancestors', the past the West has already lived out. The West, the modern West, is, in turn, the future these societies will encounter. The museum thus becomes an index of the map of the world, a taxonomy identifying cultures in time. One is forced to confront the violence encoded in this innocent bit of anthropology.

> A society with a hunting culture is more primitive and less evolved than one with a hoe culture or simple pastoralism; and these in turn are more primitive than one with industrialization.[13]

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[10] Bernard-Henri Levy, *Barbarism with a Human Face* (New York: Harper & Row, 1977), p. 51.

[11] Robert A. Nisbet, *Social Change and History* (New York: Oxford University Press, 1969), p. 195.

[12] Ibid., p. 196.

[13] E.A. Hoebel, quoted in Richard D. Alexander, *Darwinism and Human Affairs* (Seattle: University of Washington Press, 1979), p. 231.

Implicit in this model of progress are several sets of implications:

1. The increasing accumulation of science is seen as a sign of 'grace'. The West is seen as paradigmatic of scientific and technological culture.

2. The West-as-modernity obtains the mandate of power and responsibility over this world left behind by history. It is science as the modern man's 'gaze' that brings the primitive and the archaic back into contemporaneity. It is science once again that must aid in their march to modernity. Meanwhile, the 'primitive' becomes the object of the experiment, the programme called modernization.

3. Progress and modernization as scientific projects automatically legitimate any violence done to the third world as objects of experimentation. The classic example is that of Marx who indirectly justified the British colonial presence in India as the trigger for India's movement towards modernity.

Historians of science tend to condemn the notion of progress, the evolutionary law of the three stages, as 'pseudo-science', bracketing it off as an aberration of science or as a discarded paradigm. Such an act of erasure will no longer do. To use an analogy from science itself, one knows that Einsteinean physics encompasses the Newtonian paradigm; yet scientists and technologists operate with the latter in many spheres. The superseded Newton is never condemned or bracketed off as pseudo-science. Likewise, the schemas of progress and evolutionism operate to this day in the policies of modernization and development, where states are imposing the inevitability of development on reluctant cultures. Neither the action of the states nor experience of the cultures can be explained away as the unfortunate products of a pseudo-science.

IV

The experimental method so crucial to modern science is not only a system of political control, it also incorporates a unique notion of violence—that of vivisection. Within such a framework, the laboratory becomes a political structure and the basis of a wider vision of society. One can illustrate this with reference to the development of public health in India.

In September 1896, the plague struck Bombay and its surrounding areas and raged without let-up for twelve years and eight months, resulting in the deaths of thousands of people. Today, it is remembered only in medical history, and commemorative stamps issued, as a tribute to Haffkine after whom the plague research institute in Bombay is named. Within the structure of medical discourse, Haffkine's work is regarded as one of the great justifications for vivisection. The *British Medical Journal* announced that Haffkine had arrived in India from the Pasteur Institute in Paris 'to test on man the remarkable results which he had obtained on animals in the laboratory with reference to the cholera bacillus'.[14] The note added that it was struck by Haffkine's enthusiasm for the test.

There was a simultaneous plague in Egypt which is now almost forgotten. Sir John Rogers, who was then director-general of the sanitary department in Egypt, immediately instituted a series of sanitary measures. Persons found infected were isolated. All persons who had come into contact with patients were put in quarantine, where they were fed and also compensated for the loss of time. A whole set of sanitary measures, such as limewashing of infected houses and disposal of garbage within the city precincts, was carried out. The plague in Egypt ended within six months, the eventual death toll being a mere forty-five.

When the epidemic was raging in India, many doctors brought to Haffkine's notice the importance of instituting sanitary measures. But Haffkine represented what the committee called 'the laboratory point of view'. He rejected these suggestions and threw the entire weight of his scientific reputation to ensure that no sanitary measures were undertaken while his vaccine was being tried out.[15]

Vivisection, the infliction of pain on 'lesser animals' for the purposes of scientific research, is as old as Galen and Celsus, but received scientific imprimatur in the writings of Descartes. When

[14] Hellen Bourchier, 'The Uses to Which Men and Beasts Alike Are Put by the Men of Science', in Lind-Af-Hageby (ed.), *The Animals' Cause* (London: The Animal Defence and Anti-Vivisection Society, 1909), p. 78.

[15] Ibid., p. 86.

one of his visitors remarked on the poverty of his library, Descartes pointed to the animals he had been dissecting and replied, 'These are my books.'[16] Descartes' 'texts' were alive and the great methodologist believed that the cry of an animal was not due to pain, but could be compared to the creaking of a wheel. The Descartian text acquired the status of a textbook in the works of Claude Bernard and Francois Magendie.

Bernard defined the nature of vivisection precisely. The organism, he stated, had to be taken to pieces in the same way as a machine is dismantled. After dissecting the dead, one must go on to dissect the living, to uncover the functioning of those parts that are hidden or concealed. It is the operation of this character that acquires the name vivisection.[17] The hospital, said Bernard, is only the antechamber of medicine, while the laboratory constituted its sanctum.

Bernard's work reflected the intrinsic violence of science as vivisection. Vivisection is the infliction of pain for experimental purposes of understanding and control, where pain and suffering are justified in the pursuit of scientific knowledge as an absolute value. Francois Magendie 'sacrificed' 4000 dogs in order to explore the distinction between sensory and motor nerves. Some early vivisectors might have been sadists, but Bernard exemplifies the schizophrenic attitude of 'normal science' to vivisectionist violence. Bernard remarked that

> the physiologist is not an ordinary man: he is the scientist possessed and absorbed by the scientific idea he pursues. He does not hear the cry of animals, he does not see the flowing of blood; he sees nothing but the idea and is aware of nothing but the organism that conceals from him the problem he is seeking to resolve.[18]

It was necessary to quote Bernard in such detail because vivisection, which has acquired a central and permanent status within science, has now become totally banal. The pervasive

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[16] Quoted in John Vyvyan, *In Pity and in Anger* (London: Michael Joseph, 1979), p. 23.

[17] Ibid., p. 33.

[18] Ibid., p. 44.

everydayness of it masks the metaphysical shock one would otherwise have experienced. Today, over a hundred million animals are used up in the pursuit of research, in experiments ranging from hair dyes to cancer research. Peter Singer cites a 1971 survey carried out by Rutgers University which provided the following estimates of the numbers of animals used each year in US laboratories: 85,000 primates; 500,000 dogs; 200,000 cats; 70,000 rabbits; 46,000 pigs, 23,000 sheep; 1.7 million birds; 45 million rodents; 15–20 million frogs; 200,000 turtles, snakes, lizards—a total of 63 million animals.[19] One can add to it now a roll call of patients, prisoners, the poor, inmates of old people's homes, and nameless peasants in the third world.

The socialization of vivisection in science has been so extensive that even children regard it as a normal part of the educative experience. Gerald Carson cites the example of a child 'who gouged out the eyeballs of house sparrows, punished them with electric shocks when they refused to respond to light and won a science prize for $200'.[20]

Opposition to vivisection has usually been dismissed by scientists as sentimentalist. But one must see it as a paradigm for general scientific activity extending towards wider domains of control, incorporating innumerable sets of violence within the genre of vivisection. This scenario is reflected in the following chart. One witnesses the violation of the body in the search for 'scienticized' production and control. The violation of the body soon leads to the vivisection of the body-politic in theories of scientific-industrial development. And these examples are transforms of one another. The vivisectional code underlies and underwrites the violence implicit in all of them.

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[19] Peter Singer, *Animal Liberation* (London: Jonathan Cape, 1975), p. 32.

[20] Gerald Carson, *Men, Beasts and Gods* (New York: Charles Scribner & Sons, 1972), p. 201.

Vivisection

Genetic engineering

Factory farms
Slaughter houses

Mechanical
(BODY)

Nuclear physics
(Hiroshima)

Scientific management
Assembly lines

Concentration camps

The scheme tries to show that the scienticization of a problem carries within it the seeds of vivisectional violence. As a concrete example one can begin with scientific management. Modern management has its origins in the vivisection of the animal body. The first assembly lines were developed in the slaughter houses. The meat conveyor belts in the packing industry anticipated Ford's assembly lines. Braverman gives the following description of them:

> The animal was surveyed and laid off like a map; and the men were classified into thirty specialities and twenty rates of pay, from 16 cents to 50 cents. The 50 cent man was restricted to using the knife on the most delicate parts of the hide, or to use the axe in the splitting of the backbone. In working on the hide alone there are nine positions at eight different rates of pay. A 20 cent man pulls the tail, a 22-1/2 cent man pounds another part of the hide..[21]

The disassembling of the body later became the model for the assembly line. It was only a short step then to vivisecting body motions to establish the basis of Frederic Winslow Taylor's Scientific Management. The Taylorist experimental attitude is captured especially in his descriptions of his object of study, the Dutch

worker, whom he calls Schmidt. Taylor records how he decides to instruct Schmidt in order to determine the mechanics of work. He tells him:

> You will do exactly what this man tells you tomorrow from morning till night. When he tells you pick up a pig (iron), you pick it up and walk and when he tells you to sit down and rest, you sit down. You do that right straight through the day. And what's more, no back talk. Do you understand that? When this man tells you to walk, you walk; when he tells you to sit down, you sit down and you don't talk to him.[22]

Taylor himself admitted that he was surprised to find a human animal so amenable to experiment.

The 'Fordification of agriculture' is now reflected in factory farming. The notions of animal husbandry, once common to traditional agriculture, have yielded ground to the notion of animal machines. The writings of Peter Singer and Ruth Harrison have systematically detailed these processes.[23] What appears as ordinary scienticized production techniques, reflecting the violence of vivisection, acquires new power when reflected in more dramatic cases of vivisection–the concentration camp and the bombing of Hiroshima.

The excesses of the Nazi regime are explained in terms of the individual psychopathologies of Hitler, or the authoritarianism inherent in German culture. Yet these studies do not fully explain the particular nature of violence as it occurred in the concentration camps. The problem is caught by Fredrick Wertheim when he remarks:

> The mass killings in the concentration camps cannot be subsumed under any of the old categories. It is not bestial, because even the most predatory animals do not exterminate their own species. It is not barbaric, because barbarians do not have such organized, planned advanced techniques for killing people and processing them into commercial fertilizers... It was not the work of madmen, for many of the perpetrators and organizers led (both

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[21] Harvey Braverman, *Labor and Monopoly Capital* (New York: Monthly Review Press, 1974), p. 81.

[22] Ibid., p. 105.

[23] Peter Singer, *Animal Liberation*, and Ruth Harrison, *Animal Machines* (New York: Ballantine, 1966).

before and after the killings) normal, average, bourgeois, working class, professional or aristocratic lives.[24]

Part of the explanation for the pedantic orderliness of the concentration camp lies in the fact that its violence was a direct consequence of the normal science of the time. One can grasp this argument at two levels: firstly, by tracing the scientific debates of the time, and, secondly, through the wider notions of science, especially as they appeared in the records of the Eichmann trials.

The concentration camp had its roots in the nature versus nurture debates of the time. Eugenics was a part of the normal science of the time. In fact, as many as eight universities in America, including Harvard, Cornell, Brown and Northwestern, had established departments on the subject.[25] The mass killings of patients in the hospital was a direct application by doctors of established eugenic and psychiatric theory. Many of these doctors were outstanding intellectuals. Max de Crinis was a professor of psychiatry at Berlin University, and director of the psychiatric clinic of Charite, one of the most famous hospitals in Europe.[26] The mass killings had all the workings of a community psychiatry project, involving a network of mental hospitals, university professors of psychiatry, directors and staff of the hospitals voluntarily working out the normal science of their scientific theory. The first concentration camps that came into being were seen as experiments in re-education. The doctor-psychiatrists who guided it looked upon it as an attempt to eliminate 'useless eaters'–the mental patients. In 1939, there were 300,000 such useless eaters in German psychiatric hospitals; by 1946 the number had been reduced to 40,000. It was only after the basic methods of killing were worked out in these hospitals that the gas chambers were dismantled and moved to other locations. This time the 'inferior materials' were Jews, gypsies and Poles.[27]

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[24] Fredrick Wertheim, *A Sign for Cain* (London: Robert Hale, 1966), p. 130.

[25] Stephen I. Chorover, *From Genesis to Genocide* (Cambridge: MIT Press, 1979).

[26] Wertheim, *A Sign for Cain*, p. 154.

[27] Chorover, *From Genesis to Genocide*, p. 101.

The concentration camp was an industrial research laboratory organized completely by doctors and scientists. In fact, histories of synthetic chemistry which celebrate the synthesis of ammonia and indigo by the companies of the I.G. Farben group fail to emphasize its complementary role in the organizations of these camps which went beyond the use of Xyklon-B. It is in this context that I want to establish a parallel not often considered seriously, the parallel between a paradigmatic scientist like Winslow Taylor and an individual like Adolf Eichmann. Two points must be noted here: that Eichmann thought of himself as a scientist-bureaucrat, and secondly, that the banality of Eichmann's evil lay in his scientific attitude. Eichmann deserves to be recognized as a Winslow Taylor of the concentration camp. Let us not forget that the originators of the assembly line and Eichmann confronted the same problem–the management and disposal of the body. The concentration camp operated on the same logic, only the materials handled were human hair, teeth, skin or fat. All one has to do is to picture Werner Hyde, professor of psychiatry, lecturing before high Nazi officials on the merits of carbon monoxide.

The question of the 'banality of evil' in the Nazi bureaucracy has been raised by Hannah Arendt[28] and Bruno Bettelheim.[29] Bettelheim emphasizes that by all 'scientific' standards Eichmann was a 'normal' person. Half a dozen psychiatrists had certified him as nórmal. One psychiatrist even said he was 'more normal at any rate than I am after having examined him'.[30] Another found that Eichmann's 'whole psychological outlook towards his wife, children, mother and father was not only normal but most desirable'.[31] With Bettelheim one can then wonder how to account for the incongruity of the murder of millions and the normality of the man in the dock. Bettelheim's explanations concern the structure of scientific and legal detachment. He notes that Eichmann lacked what might be called a fully expert knowledge and remarks that Eichmann had only read two books on the subject but he considered them as embodying 'a scientific approach to the problem'. Bettelheim adds that without this notion of scientific detachment, the inhumanity of modern totalitarianism cannot be understood.

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[28] Hannah Arendt, *Eichmann in Jerusalem* (Harmondsworth: Penguin, 1965).

[29] Bruno Bettelheim, *Surviving and Other Essays* (New York: Vintage Books, 1980).

[30] Ibid., p. 259.

[31] Ibid., p. 258.

The last example that I wish to discuss is the bombing of Hiroshima. The bombing of Hiroshima embodied the violence of vivisection at three phases of its career: first, in the very decision to bomb the city; second, in the attitude to the survivors of Hiroshima; and, third, in the continuities of nuclear research itself.

Friedrich Wertheim points out that there is a persistent myth that scientists as a group were against the dropping of the bomb. He contends that the leading scientists not only helped the governments in making the decision but picked Hiroshima and Nagasaki as experimental sites. The cities were free of the devastation of incendiary bombs and were thus appropriate sites for the scientific evaluation of the nuclear impact. But what is more frightening is the general absence of atonement after the bombing. In fact, in *The Children of the Ashes*, Robert Jungk shows that scientists saw in it new possibilities for science.[32] The city became in their eyes an industrialized table of symptoms to be subjected to clinical gaze. Jungk describes scenes at the Atomic Bomb Casualty Commission (ABCC) clinics where patients were studied in a Taylorist fashion, to be 'thumped, have light shone in their eyes, be photographed, pumped full of serum'.[33] None of the specialists ever explained why or with what purpose all this was done. If a patient asked, 'What do you advise, doctor? What can I do to get well again?' the reply was always the same, that the clinic was not a therapeutic establishment but a research institute.[34]

The disjunction between research and healing, implicit in vivisection, reminds one of the statement of the French physiologist, Charles Richet:

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[32] Robert Jungk, *The Children of the Ashes* (London: Heinemann, 1961).

[33] Ibid., pp. 267–8.

[34] Ibid., p. 240.

> I do not believe that a single experimenter says to himself, when he gives curare to a rabbit, or cuts the spinal marrow of a frog, here is an experiment that will relieve or cure the disease of some man. No, in truth, he does not think that. He says to himself, I shall clear up an obscure point. I shall seek out a new fact.[35]

The third element in the Hiroshima story is the return of the scientists, some of whom who had protested against the bomb, to the laboratories which produced the bomb. Jungk cites the case of the brilliant Hans Bethe who had condemned the bomb as anti-Christian and genocidal, and who a few years later became one of the enthusiastic exponents of the H-Bomb. Such macabre enthusiasm can only be understood by focusing on the internal structure of science as a mode of cognition, where violence is justified in the objective pursuit of knowledge. There seem to be no internal checks to its cognitive imperatives.

A colleague of mine once remarked that vivisection anticipated Auschwitz, and Auschwitz the vivisectional imperatives of the new experiments in planning and development. The objectivity of science is embodied even in the plan of the revolution, be it that of Mao or of Stalin. They all justify the imposition of suffering on millions in the name of scientific development. One wishes that critics of science would confront this genre of violence somewhere in the timetable of their programmes.

V

I sometimes wonder what is worse
A secret or a lie
A word unspoken or left unsaid
When either way a man is dead
I still maintain,
It is not death that is important
But the manner of dying
Like a child's first poem
Wiped by a careless eraser.

—'Villagers Die in Bhabha City' (*The Times of India*)

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[35] Vyvyan, *In Pity and in Anger,* p. 77.

Lurking quietly within modernity-as-a-scientific-project is the idea of triage. Triage has been the silent term mediating between the ideas of vivisection and progress. Vivisection as an experiment has implicit within it the idea of indifference, and progress implies obsolescence. Triage interweaves these ideas as the obsolescence of those one is indifferent to.

With the reappearance of triage, as a formal concept, modernity has come full circle. If progress demands the summoning of the Other into modernity, triage implies dispensing with the Other. Both concepts include the idea of science as memory. Science once felt that tribal societies had no history; today, it seems to have decided that they have no future. If the tribal was once whipped into modernity because he was a savage, today he is being bludgeoned back as being incapable of science. The decision in both events is articulated as part of the discourse on rationality, while societies and cultures are now being destroyed because they are considered refractory to the scientific gaze. Triage is the final abandonment of modernity as a universalizing project. The western encounter with the Other ends in its eventual logic as erasure. Triage blends with the other great strand of modernity-as-rationality, the atomic holocaust; the two death warrants threaten to put an eventual stop to the world as a modern world.

Triage is a French word which referred, in the eighteenth century, to the sorting of coffee beans or pelts. It acquired a certain stability in medical dictionaries as the method of screening patients to determine priority of treatment, particularly when the demand for medical treatment outran the supply of medical facilities and personnel. Richard Rubenstein in his book on triage cites an example of such a process. It relates to the manner in which scarce penicillin was distributed among American soldiers during World War II. Rubenstein explains:

> Some of the stricken men had received their wounds in battle, others in brothels; it was decided only soldiers with venereal diseases would be given penicillin even if it meant that some of the wounded would die without it.[36]

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[36] Richard Rubenstein, *The Age of Triage* (Boston: Beacon Press, 1983), pp. 195–6.

The rationale was as follows: as those with broken bodies could not swiftly resume military duties, even with penicillin, those with venereal disease were treated, for they could be despatched to the front in a few days. Today the concept of triage has escaped the confines of the hospital and acquired a wider socio-political connotation. It is the history of this wider notion of social triage that we must seek to construct.

Science has no place for the defeated except as objects of experiment. The rudimentary notion of social triage has always been present. Triage represents a notion of obsolescence beyond that involved in the free market. The obsolescence created by the market has been chronicled in the writings of political economists since Adam Smith. Social triage differs from it in that it is a deliberate decision or act of state to define a target group such as a minority within its territory as dispensable. The decision, however, must also be articulated on rational grounds. For, though triage is genocide, it involves the rational imposition of death on those regarded as refractory to the scientific gaze. It is in this sense that the term helps us to understand the particular quality of violence of which scientific rationality is capable. Let me cite some examples.

With the impact of the Enclosure movement in England, peasants became an uprooted class. Poverty and vagrancy, which at the time often went together, were recognized as social problems. The poor as vagrants, lunatics, criminals, even as children were considered to be refuse and regarded as expendable. Children in particular were used in a large number of hazardous jobs. They were often sold to workhouses for a few guineas. What was originally left to the free play of market forces was conceived of in a grander, more centralized fashion by the utilitarian theories of Jeremy Bentham. Bentham visualized a grand scheme—never operative—whereby those classified as refuse—children, lunatics or vagrants—were placed in a total institution, subject to complete surveillance and harnessed as work units by the state.

Richard Rubenstein notes the theoretical continuity between Bentham's organization, the Panopticon, and the attempts by I.G. Farben to utilize death camp labour for the production of synthetic rubber.[37] Both were efforts to rationalize the use of those who were defined by the society as waste–the poor–as 'refuse' in Bentham's time, and the 'useless eaters' in Hitler's Germany.[38] The notion of triage goes beyond the rational utilization of such categories of people, to include a discourse on their death, reconceptualized as a problem of disposal. The Benthamite project embodied in the poor-house sought to rationalize philanthropy as a project. Triage later on was to convert aid-as-tutelage to aid-as-erasure.

These are two separate processes of sorting here. The first involves the classification and exploitation of marginals in a society. The second centres around the elimination or death of those regarded as marginalized and obsolescent.

The re-emergence of triage within the debates on development has to be constructed along two conceptual foci. The first centres around the debates regarding the coming of the post-industrial society, and the second around the resurgence of the new reductionism, as evidenced in the emergence of socio-biology as a discipline.

Krishna Kumar, in a fascinating book, has referred to the spate of neo-Comtean schemes mapping out the future of the industrial West.[39] Self-styled as 'post-modern', 'post-civilizational', or 'post-industrial', these scenarios have in common the belief that modern industrial society is undergoing a structural change where the largest part of the work force is no longer in agriculture or industry but in the service sector. This tertiary service sector is also differentiated into an additional quaternary sector, composed basically of scientists and other knowledge workers. Predictably, what is central to such societies is the centrality of theoretical knowledge, the primacy of theory over empiricism, the fact that formal theoretical knowledge provides the dynamic of innovation as expressed in synthetic chemistry or in the material sciences.

What is interesting about these descriptions are their silences. There is a feeling that the third world is irrelevant, that the new

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[37] Ibid., p. 75.

[38] Chorover, *From Genesis to Genocide,* p. 154.

[39] Krishna Kumar, *Prophecy and Progress* (Harmondsworth: Penguin, 1978).

developments in electronics, solid state physics and chemistry have rendered it unnecessary. Science has generated surplus which in turn has enabled modernity to escape from its reliance on the third world for raw material or labour. The third world, according to Kumar, is now 'something to be cast away, once its riches have been plundered and its cultures smashed, like a child throwing away a ruined toy'. It is now conceived as an area for tourism or for the siting of some of the more polluting industries of the world.

This process is abetted by the legitimation provided by socio-biology in the works of Edward Wilson, Richard Dawkins[40] and Garrett Hardin.[41] Our examination of these arguments centres around two seminal papers: 'The Tragedy of the Commons' and 'Lifeboat Ethics'.[42] If the nuclear holocaust had its macho-rationalist in Herman Kahn, development as triage has Garrett Hardin. What we shall try to explore is not Hardin's arguments but the classificatory structure of the thought underlying it. His two papers are like parables with an Euclidean lucidity about them. Once you accept the axioms, the logic of the world they unfold follows ruthlessly. Therefore it is the basic assumptions that we must map. Hardin's work (1) posits an opposition between individual greed and social good and believes that the only solution is the Hobbesian one of coercion; and (2) it holds that morality or humanism are no substitutes for hard-headed science either in the short or the long run. In fact, like other socio-biologists, he sees altruism as pathological in the context of the problem of survival. He fails to encode the opposition between biology and culture in cosmological terms, and lacks the conception of an ecologically coded society, a vision of a society that sees science as a part of the sacred or man as a fragment of the cosmos. The two papers can now be read as successive denouements of one plot.

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[40] Edward O. Wilson, *On Human Nature* (New York: Bantam Books, 1979); Richard Dawkins, *The Selfish Gene* (New York: Oxford University Press, 1976).

[41] Garrett Hardin, *Promethean Ethics* (Seattle: University of Washington Press, 1980).

[42] Garrett Hardin, 'The Tragedy of the Commons', in S.D. Blanard and John von B. Rodenbeck (eds.), *The House We Live In* (New York: Macmillan, 1971), pp. 245–8; and Garrett Hardin, 'Lifeboat Ethics', in W. Aiken and H. La Follette (eds.), *World Hunger and Moral Obligation* (New Jersey: Prentice-Hall, 1977), pp. 12–21.

As I have said, the formulation that Hardin offers is basically a Hobbesian one. The commons is any physical facility which is commonly owned or used. It can be an ocean, a lake, a forest or a prairie. The logic of the commons unfolds as follows. The commons is a state of nature, where every man seeks to maximize his individual gain. Initially it was a period of abundance. The problem begins in a situation of scarcity. As each individual pursues his own interest, as individual utilities are maximized, there is an increasing threat to the social good. The eventual result is the degradation of the commons. For Hardin, like Hobbes, an appeal to conscience is futile. Only 'mutual coercion, mutually agreed upon by the majority of people affected' will do.[43] What is missing in Hardin's notion of the commons is the idea of *communitas*. Any reading of anthropology, except the anthropologically suspect work on the Ik, would have shown Hardin that traditional communities avoided the tragedy of the commons because the management of the commons was a matter of total community; it was not a matter for the individual. It was always a matter of community ethics for group survival, which meant that it was based on 'what they contributed to the environment—what they gave, and not what they took'.[44]

Hardin's study of rationality and the commons also lacks a concept of *communitas* as a sense of the sacred. Rationality, to Hardin, amounts to an absence of the sacred. He sees the individualism of the group as being restrained by society; individual biology confronting the social group. The fact that societies have to be looked on as a wider relation between man, nature and God is alien to Hardin. He describes the earlier period of the commons in a manner that would leave any tribal aghast.

> A hundred and fifty years ago, a plainsman could fell an American bison, cut out only the tongue for dinner and discard the rest. He was not in any important sense being wasteful. Today with only a few thousand bisons left, we would be appalled at such behaviour.[45]

The real tragedy of the commons is captured more poignantly in this one sentence than in the rest of the essay. It shows that Hardin's Hobbesian rationalist science, embodied in planning, has no conception of the sacred. As a result, ecology becomes a managerial science rather than a cosmic view of the world, mopping up the ecological degradation after industrialization. Affinity to nature is seen more as humanistic romanticism than as an axiom for science.

The pity of it lies in the fact that many of Hardin's critics internalize the same structure of thought. They seek to inject humanism or morality into this view of science to 'contain' it, while leaving science itself, as a worldview, intact. The tragedy of the commons is in fact the tragedy of rationality and science, of a worldview which has so lost its sense of the sacred that it fails to see that science—rationalist, hegemonic, value-neutral, schizophrenic—has become the major anti-ecological force today. Like the scientist's own invention, Maxwell's Demon, science today stands as the major cognitive gatekeeper, preventing a return to a genuinely ecological vision of the world.

This brings us to the second essay of Hardin, 'Lifeboat Ethics'. The Leviathan that was once a commons has become a constricted lifeboat. Each rich nation can be seen as a lifeboat full of comparatively rich people. In the ocean outside swim the poor of the world, who would like to get in. What should the lifeboat passengers do?[46] The questions are simple. Is aid to these starving people necessary? Should America aid the people of Ethiopia? Is altruism rational?

The background to these issues was the controversial work of the Paddock brothers, *Famine—1975*.[47] The Paddocks argued that since America accounted for more than half the cereal grain in international trade, it had to decide whom it must save. They recommended a system of triage, where the most hopeless nations were to be left without food. Hardin agrees with them and goes even further in criticizing the establishment of a world food bank to rescue starving nations. For Hardin, the poor are irrational, superfluous, multiplying much faster than the rich. He warns against the establishment of the proposed world food banks to rescue starving nations, arguing that it would be a commons in disguise:

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[43] Hardin, 'The Tragedy of the Commons', p. 256.

[44] Quoted in Nicholas Polunin, *Growth Without Disasters* (London: Macmillan, 1980), p. 545.

[45] Hardin, 'The Tragedy of the Commons', p. 251.

[46] Hardin, 'Lifeboat Ethics', pp. 16–17.

[47] William and Paul Paddock, *Famine—1975! America's Decision: Who Will Survive?* (Boston: Little Brown, 1967).

> The less provident and less able will multiply at the expense of the abler and more provident, bringing eventual ruin on all those who share the commons.[48]

Hardin finds individual altruism even more pathological. For Hardin altruism can only exist on a small scale, over the short run. Other socio-biologists add that altruism and universal love are concepts which do not make any evolutionary sense. Consider Hardin's account of Mother Teresa:

> It is commonly estimated that a fourth of a million of India's poorest sleep on the streets of Calcutta. Many of them die every night and are removed by municipal drays. Many others, near death, have trouble moving the next morning. Some of these are picked up by Mother Teresa's workers and carried away to a rest home where they are bathed, put in clean apparel and fed. The idea is to give them a dignified death... What then? The bed of the survivor is needed for a new candidate for death (for which Calcutta's nocturnal sidewalks and alcoves furnish a more than bountiful supply). So the recovered Indian is put on the sidewalks—'to try again' as it were. Sooner or later he will fulfil the implied contract... The question we cannot refrain from asking, does Mother Teresa increase or decrease the amount of suffering in the world.[49]

I think the answer has to be that Hardin cannot be the analyst, for he is the case study. His cost-benefit analysis will not do. The crucial issue is not the dualism either between compassion and science or between the prisoners' dilemma and the zero-sum calculations of triage.

The crucial issue is that science has failed to guarantee life or understand its meaning. It has given the poor of the third world only

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[48] Hardin, 'Lifeboat Ethics', p. 17.

[49] Hardin, *Promethean Ethics,* p. 63.

the language of socio-biology. If life is eventually a hopeful wager, then our hope lies in believing that the Gandhis and Mother Teresas are the real scientists, not mere sentimentalists. The intuitive compassion of the nun, like the intuitive responses of the tribal to nature, is more life-giving and ecologically sound than all the science and modernism of the Hardins and the Paddocks of the world.

VI

Which company came to my land to open a 'Karkhana'?
It awakened its name in the rivers and the ponds calling itself the D.V.C.
It throws earth, dug by a machine, into the river.
It has cut the mountain and made a bridge. The water runs beneath.
Roads are coming, they are giving us electricity, having opened the 'Karkhana'.
The praja all question them. They ask to what this name belongs.
When evening falls they give paper notes as pay.
Where will I keep these paper notes? They melt away in the water.
In every house there is a well which gives water to grow brinjal, cabbage.
Every house is bounded by walls which makes it look like a palace.
This Santhal tongue of ours has been destroyed in the district.
You came and made this a bloody burning ghat, calling yourself D.V.C.

A song sung in the Purulia District of West Bengal
(Translated by Roma Chatterjee)

Underlying the notion of the modern state and the notion of science is a monolithic worldview. The nation-state cannot permit ethnicities which serve as competing sites for power, and modern science cannot tolerate the legitimacy of folk or ethnic knowledges. Both kinds of ethnicity violate the modern conception of order. The Hobbesian project which encapsulates modernity as a creation myth was literally a contract between state and science to manufacture the idea of a mass society of equal and uniform individuals. Modern society was monocultural in more ways than one.

The tragedy of modernization in the third world was, however, doubly violent. It sprang not only from the violence of the West through colonialism and science but from the modernist impulse of our elites, internalized without a clue as to its genealogy and its self-doubts. Independence thus was literally a celebration of science. If it was a 'tryst with destiny', as Nehru called it, then destiny—the future—'belonged to those who made friends with science'. There was an Euclidean clarity about this commitment, and a touch of innocence about the faith in the power of rationalist science and its technocratic projects. Thus, dams, laboratories, railways and hospitals become rorschachs of statist goals and scientific endeavours. For Nasser and his followers, Egypt after the Aswan Dam 'would be a paradise'.[50] Nkrumah believed that with the construction of the Volta Dam, 'Ghanians would cease being hewers of wood and drawers of water for the west'. Today when science has failed to deliver one realizes the irony of such innocence. Yet the pursuit of the state continues to be science, the energy for the perpetual machine of statist endeavours. Scientific projects, as Big Science, are an integral part of the Big Government model of today. There is a deeper issue here. Science is not just a sacred cow; it is a fat one, and the elites realize that it provides legitimation for their greed. The parasitism of the elite feeding on technological projects, growing fat on bribery, fixing, and contracts, is proverbial. The symbiosis between state and science has several elements within it. I shall elaborate on it with examples from irrigation projects. The statist involvement in irrigation is theoretically crucial. Hydropolitics, as Wittfogel has pointed out, was paradigmatic of the relation between the state and science.[51] The critique of hydropolitics becomes a critique of the modern state as a technological project. We shall take as our text Edward Goldsmith and Nicholas Hildyard's *The Social and Environmental Effects of Large Dams*, supplementing it with examples from nuclear energy.[52]

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[50] E. Goldsmith and N. Hildyard (eds.), *The Social and Environmental Effects of Large Dams* (Cornwall: Wade Bridge Ecological Centre, 1984), p. 254.

[51] Karl A. Wittfogel, *Oriental Despotism* (New Haven: Yale University Press, 1957).

Underlying modernization is a substratum of intolerance. The variegated traditions of the third world—the nomadic, the tribal, the pastoral and the peasant—have to be bulldozed into a flatland called modernity and there is little time for consultation. A Sudanese politician summed it up well when he remarked, 'If we have to drive our people to paradise with sticks, we will do so for their good and the good of those who come after us.'[53] So convinced is the elite in its belief in progress that its authoritarian tilt is all too visible. Not all cultures were as ruthlessly clear as the former Soviet Russia, where the KGB was responsible for water projects, for such projects involved resettlement.[54] Most development projects are presented as a *fait accompli* to the people.

> At one end of the scale, people receive scarcely a warning that waters will arise. Others may be notified but neither compensated nor assisted to move... Lengthy police intervention, military coercion and the bulldozer sanction, which is used in places, is acclaimed to be successful if bloodshed can be avoided.[55]

To the laboratory state, these people are not scientists, but ethnic people practising styles of life—agriculture, medicine, crafts—which are refractory to science. According to the logic of development, they must either acculturate or disappear. For this, the laboratory state must break the rituals of tribalism and traditional farming.

In the process, peaceful development has created more refugees than have bloody wars. The list is awesome. Ghana's Volta Dam saw the evacuation of 78,000 people from 700 towns and villages; Lake Kingi in Nigeria displaced 42,000; the Aswan Dam 120,000; the Kariba Dam 20,000; Turkey's Keban Dam 30,000. The Panon Dam in Vietnam will uproot 500,000 people and the Three Gorges Dam in China an estimated 2,000,000 people. In the Philippines, forty new dams will displace 1.5 million people.[56] Closer home, the dams in the Bastar area will inundate 1,70,000 hectares of land. It is scientific mandate that justifies the violence of such displacement.

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[52] E. Goldsmith and N. Hildyard (eds), *The Social and Environmental Effects of Large Dams* (Cornwall: Wade Bridge Ecological Centre, 1984).

[53] Ibid., p. 18.

[54] Ibid.

[55] Ibid., p. 19.

Even the word displacement is used wrongly here. The linguistic connotation is of hydraulics, of mass being moved indifferently across space. To a politician (and the technocrat) the idea that flooding a plot of land might destroy a culture is incomprehensible. They fail to realize that to a traditional people, land is not real estate or a space over which people are moved like objects. Land is memory, a map of one's world, a way of life for which people are willing to die.

What we are in fact confronting here is development as slow genocide. The irony of the tribal-peasant turning into a refugee becomes even more poignant in today's India. At one end, the tribal-peasant and the peasants who are natives are defined as squatters on their own ancestral land, confined to refugee camps called parks. At the other end, the laboratory state invites non-resident Indians, particularly scientists and engineers, to set up new industries. It is establishing technology parks and science cities for them. Today, to be scientific is to be. The tribal as a native is a refugee while the non-resident Indian as a scientist is defined as more than a citizen. Haussmannism is intrinsic to all such technocratic projects, including the resettlement activities of technocrats, such as those of Jagmohan during the brief Emergency era in India.

To the Haussmannism of the dam as project, we should add its Haffkineism. Large dams literally become experiments on the people. So does the new technology of nuclear plants. Robert Jungk has observed in *The Atom Staat* that many reactors have been built without full knowledge of their behaviour and located on sites close to large cities.[57] The technology of most large dams is basically vivisectional. With limited simulation, they are imposed on the people. Goldsmith and Hildyard note that 'many dams fail as a result of what Widstrand calls "the pilot plant syndrome"'.[58] The

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[56] Ibid., p. 15. See also ch. 2 in this volume.

[57] Jungk, *The Atom Staat* (*The New Tyranny*) (New York: Warner Books, 1979), p. 57.

[58] Goldsmith and Hildyard, *Large Dams*, p. 105.

contractors and engineers assume that the technology used to build small dams can be used, with little or no modification, for putting up large dams. Indeed, as Philip Williams points out, 'The new technology of large dams is only imperfectly understood and largely relies on the extrapolation from the design of smaller dams.'[59]

Similar problems of 'scaling up' have been encountered in the nuclear industry. In fact, Williams regards the technology of large dams as being, in many ways, comparable to that of nuclear power plants. 'Both require massive capital expenditures; both are new technologies with limited operating experience; and, for both, the consequences of catastrophic failure are large-scale devastation.'[60] Although the hazards associated with nuclear power are now generally acknowledged (though this has rarely been allowed to interfere with governmental nuclear policies), those associated with the building of large dams still tend to be ignored—this despite our knowledge that the failure of a large dam could cause the loss of hundreds of thousands of lives and billions of rupees worth of damage.

For the native in the refugee camp, death is a slow process. For older people, the moment of disruption is also the moment of dying, because few can make the transition to the new regime. For the living, the image of catastrophe acquires a new dimension. As Goldsmith and Hildyard remark:

> There is scarcely a scheme in existence which has avoided the twin problems of cultural disruption and social alienation. People moved from their homes are typically passive, dispirited and lacking in initiative. No amount of government aid can compensate for loss of land handed down through generations.[61]

The idea of market or of science is a poor lens through which to recognize the sustaining relation between people and their land. For the market, compensation terminates the contract and for the scientist-technocrat, the development of all land is inevitable.

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[59] Ibid., p. 105–6.

[60] Ibid., p. 106.

[61] Ibid., p. 106.

Neither market nor science can capture the symbolic universe of the peasant-tribal. When Guyana's Akawaio Indians were asked 'to contribute to development' by vacating their land, their headmen wrote the following letter to Prime Minister Forbes Burnham:

> This land is where we belong–it is God's gift to us and has made us as we are. This land is where we are at home; we know its way: and the things that happen here are known and remembered, so that the stories the old people told are still alive here...This land is the place where we know where to find all that it provides for us–food for hunting and fishing, and farms, building and tools, materials, medicines. Also the spirits around us know us and are friendly and helpful... If we had to move, we would be lost to those who remain in other villages. This would be a sadness to us all, like the sadness of death.[62]

What was an appeal is today an obituary: the obsolescence encoded in progress had no place for the sacredness of memory.

From cultural destruction through obsolescence to triage-as-erasure is a short step. The most moving case is the systematic elimination of the Aché through what are called forest clearance programmes. Behind it is the plan for building one of the world's largest hydro-electric power plants. To the giant corporations and its agents, the Aché Indians are an inconvenience. The forest must be cleared and the Indians hunted down. Richard Arens in his *Genocide in Paraguay* describes it thus:

> Men, women and children are being indiscriminately mowed down in such hunts. The preferred weapon of the massacre was the machete which saved the expense of bullets. Those willing to accept unadulterated slavery might also be kept alive at a subsistence level and without medical attention. The majority of those left in the reservation succumbed to despair and disease. The use of their language was discouraged, their traditional music prohibited... About one half of a recently captured band [of Aché's on a reservation] was liquidated by the *conscious withholding of food and medicine.*[63]

The elimination of the Aché Indians has raised in a fundamental way the problem of genocide through development. The process of resettlement, involving slow death through deculturation, does fall within the clauses of the Genocide Convention. Item 3 of the Genocide Convention of the UN includes, 'Deliberately inflicting on the group conditions of life calculated to bring about its physical destruction in whole or in part'.[64] Precisely this kind of realization has triggered the protest movement against the proliferation of dams in recent years.

The recognition that development could be ethnocidal is present in the massive *morcha* at Gadchiiroli under the leadership of Baba Amte and Lal Shamshah Maharaj, against the Ichampalli and Bhopalapattanam projects. Amte drew attention to the fact that at least 40,000 tribal persons would be uprooted along with millions of trees. Of course the intention is to transplant these people elsewhere with the help of some monetary compensation. But nothing can compensate them for the trauma they would suffer in leaving their traditional environment for an alien setting. To remove tribal people from their natural habitat would be cultural ethnocide. Amte's appeal to the Prime Minister received the usual bland reply. But the logic of such development was clear, at least to the tribals and to some other sensitive Indians. For instance, Sunderlal Bahuguna realized that they were confronting the local variant of a worldwide phenomenon. He reminded the morcha that tropical forests were dwindling throughout the world, that the rapid pace of industrialization posed a threat to the very survival of humanity in some areas. The movements against the genocide of the Aché, the morcha against the Ichampalli dams–all confront the problem of obsolescence as a consequence of expanding development and limited resources. They all confront the fact that the laboratory state now deems certain cultures as dispensable.

The notion of calculated dispensability, of erasing people from the commons of the world, has several dimensions. Firstly, in triage the present generation can be treated as dispensable. An outstanding example of this is Stalin's planocentric vision, where a whole generation could be sacrificed for a better future. The current experiments in nuclear energy, especially the storage of nuclear wastes, literally condemns a *future* generation. It is estimated that nuclear wastes, unlike other bio-degradable materials, may remain active for 50,000 years. The transfer of pollution-prone industries to the third world is yet another example of the same vision. Recently, China has agreed to store nuclear wastes from Germany in the Gobi desert in return for foreign exchange! Likewise, while Europe is no longer used as a site for nuclear testing, the space of the third world is regarded as appropriate for the purpose, for it is ultimately dispensable. John Doom, the Tahitian delegate to the World Council of Churches Meeting on Nuclear War, remarked:

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[62] Ibid., p. 27.

[63] Richard Arens (ed.), *Genocide in Paraguay* (Philadelphia: Temple University Press, 1976), p. 8.

[64] Ibid., p. 135.

> The Pacific, the forgotten third world, is well known as being a very big ocean. We are more than five million native islanders who live in the ocean. We say that the Pacific is our continent. Your continent is Europe or the States. The Pacific belongs to us. We think from sea to land not from land to sea, because the sea is our life... I would like to ask a question. We want to ask the Europeans, why do you come here to do your testing? Why?[65]

Closer home, Praful Bidwai, in his *Times of India* articles, has shown how policies of triage have been employed against seasonal workers repairing leaks at the Bhabha Atomic Research Centre near Bombay.

What we are witnessing today is a civil rights movement against development-as-terrorism, based on the recognition that the modern state committed to science has become the prime anti-ecological force of the world. What development projects like dams or nuclear reactors or legislations about forest lands reveal is the necessity of new concepts of civil rights. We need new concepts which grant rights to future generations. Recently, it has been suggested that we recognize the rights of natural objects like trees, forests, rivers and seas. But contractual or legal systems cannot serve as the basis for ecology. One needs a return to the sacred, where a community recognizes its moral responsibility for its environment. The Chipko movement is a superb example of such consciousness. The recent raids by peasants on forest nurseries in Karnataka where they uprooted thousands of eucalyptus seedlings represent another example of such a will to ecology.

These movements inaugurate one of the finest challenges to the scientific regime. They pinpoint that rationalist science is a repressive regime, that tribal cultures and peasant agriculturists are often more ecologically sound than the modern scientist. One is slowly realizing the deep wisdom of swidden farming. Ecologists have admitted that it is the right way to cultivate a tropical forest. We are forced to confront the fact that green-revolution reductionism is no substitute for traditional, ecologically-sensitive practices. This insurrection of the local knowledges which demands a return to the sacred provides the crystal seed around which the challenge to the laboratory states of modernity has begun.

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[65] John Doom, 'The Protest by Churches on Nuclear Testing in the Pacific', in Paul Albrecht and Ninan Koshy, *Before It Is Too Late* (Geneva: World Council of Churches, 1983), p. 354.

Footnotes to Vavilov: An Essay on Gene Diversity

I

In his *Gulag Archipelago*, Alexander Solzhenitsyn has a series of moving observations about the Russian scientist Nikolai Vavilov. Vavilov, director of the Research Institute of Plant Breeding, was arrested in 1940 during the high tide of Lysenkoism. The scientist was forced to endure over 400 interrogation sessions but even then refused to confess at his trial on 9 July 1941. Sentenced to death, he was made to wait several months, confined in a small basement cell without a window. The sentence was commuted later, but Vavilov, already ill from torture, died in 1943. In a footnote, the relentless Solzhenitsyn adds that Vavilov's interrogator, Khvat, lives in peaceful retirement, spending his pension at 41 Gorky Street.[1]

History has been doubly unfair to Vavilov. A great scientist, he saw his school of genetics destroyed by Stalin. The attempts to rehabilitate him have failed to do full justice to the potential complexity of his ideas and the debates around him have a truncated quality about them. Vavilov was the centre of two far-reaching debates, one of which is read stereotypically as the Lysenko affair; the other concerns the death of diversity. Together, the two constitute probably the most significant morality plays of modern science.

The history of the Lysenko affair is rendered as one of those typical persecution stories, which operate in science as the equivalents

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[1] Alexander Solzhenitsyn, *The Gulag Archipelago*, I–II (New York: Harper & Row, 1973).

of creation myths. Vavilov was one of the pioneers of genetics in Russia. A student of Bateson, he returned from Cambridge to succeed Eduard Regel as director of the Institute of Plant Breeding. The plot then reads as a tragedy of how Lysenko, the imposter, destroys Vavilov and his school. The conflict is portrayed as one between state and scientific expertise, ideology and science.

Dominique Lecourt[2] in his more subaltern reading, points out that there were two stages in the controversy. In the first, Lysenko was an object of fun for the leading scientists who saw him as a local technician with his recipes for vernalization and crop rotation. In this limited sense, Lysenko might have had a restricted relevance to which even Vavilov admitted. Vernalization did alter the maturation time of seeds and this was crucial for agriculture in winter climates. At this stage, the conflict was a simple one between a group of scientists pioneering in a new field (genetics) and technicians who challenged them to prove their practical relevance; convinced that 'genetics was an amusement like chess or football'.[3]

It was only at a later stage that this system of recipes regarding crop rotation and vernalization acquired an ideological baggage. The latter included a defunct Lamarckianism which claimed that characteristics acquired in an organism's lifetime could be passed on to future generations.

Mature Lysenkoism, as Lecourt[4] and Sullivan[5] point out, began as a collaboration between I.I. Prezent, pedagogue and ideologist, and Lysenko. It was only then that the system of techniques became transformed into an imaginary science. Lysenko played the peasant Stakhanov who wanted to be his own Winslow Taylor. His was an attempt to create a revolutionary science which would help collectivization. The combination of Lysenkoism and collectivization proved humanly devastating. The danger began when peasant knowledge began to see itself being as universal as modern western science, that is, when the local and concrete was no longer celebrated as such but sought to transform itself into a revolutionary ideology. Lysenko, as the Savonarola of an imaginary Soviet science, emasculated a whole school of genetics.

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[2] Dominique Lecourt, *Proletarian Science? The Case of Lysenko* (Norfolk: New Left Books, 1977), pp. 445–6.

[3] Walter Sullivan, 'The Death and Rebirth of a Science', in Harrison Salisbury (ed.), *The Soviet Union: The Fifty Years* (New York Times Company, 1967), pp. 276–8, 284.

[4] Lecourt, *Proletarian Science*, p. 47.

[5] Sullivan, 'The Death and Rebirth of Science', in Salisbury, *The Soviet Union*, p. 281.

Eventually Lysenko was discredited and the conflict between ideology and science ended in the victory of the latter. There is also a tendency to isolate the Lysenko affair and deny the themes underlying Lysenkoism and the debates on diversity. Vavilov is once again read 'passively' and becomes a humanistic backdrop to the Green Revolution.

The debates on gene-diversity, of which Vavilov was once again the centre, show that Lysenkoism is only one side of the story. They reveal that the Green Revolution of the future could be more problematic for scientific expertise than Lysenkoism.

A conventional reading of the Lysenko affair might suggest Vavilov as the paradigmatic expert, proud of the modern science of genetics. But Vavilov was deeply sensitive to the achievements of traditional agriculture and peasant knowledge. He realized that long before the advent of modern science, agriculture had produced generations of successful plant breeders. He would have agreed with Alphonse Candolle's observation that men have not cultivated within the last two thousand years a single species which can rival maize, rice, the sweet potato, the bread fruit, the date, millets, sorghums, the banana and the soya bean. He realized that modern agriculture was dependent on these traditional forms and to sustain itself, it had to periodically collect these traditional varieties. Based on his law of homologous variations, Vavilov presented a theory which systematized such efforts. He proposed that there were eight major centres of domestication and diversity, later called the Vavilov zones, six in the old world and two in the new. Vavilov originally claimed that these zones were not only centres of the origin of plants but areas with the greatest number of domesticated forms.[6]

[6] See Erich Issac, *Geography of Domestication* (Englewood Cliffs: Prentice Hall, 1970), ch. 4.

His institute of plant breeding organized a series of expeditions to centres of diversity all over the world: to the Andes for potatoes, Mexico for corn, Ethiopia for barley. India was the only zone that Vavilov was not allowed to enter. By 1940 Vavilov's collection had 250,000 entries including 30,000 accessions of wheat, 10,022 of corn, 23,636 legumes, 17,955 vegetables.[7] Shifted to Estonia during the war, the collection was confiscated by the Germans but returned after the war. The collection was, however, ignored during the Lysenko era and lost much of its authenticity and vitality. Walter Sullivan narrates that Vavilov was arrested by the Russian authorities while collecting plants in Polish Galicia. His colleagues never met him again, 'although it is said that they ultimately received his briefcase, crammed with plants. At the top–the last specimen that he plucked before his arrest–was a previously unknown variety, the most important find of the expedition.'[8]

The technical complexities of the Vavilov zones need not detain us. But the formulation itself raised a series of questions in relation to archaeology, sociology and politics. A search for the origins of agriculture became simultaneously a reflection on the future of agriculture and raised many questions.

Vavilov showed that not only was modern agriculture dependent on traditional agriculture, but also suggested that there was a rough correlation between agricultural diversity and ethnic styles. The Vavilov zones were generally isolated areas where farming communities, by maintaining traditional forms of agriculture, had preserved and sustained these vital gene pools. This immediately raised the question as to what should be the relation between scientific and traditional forms of agriculture. How should the Borlaugs and Swaminathans relate to the expertise of the maize planters of Mexico, the Sorghum growers of Sudan, or the rice cultivators of India? In discussing this, science was forced to confront a whole series of Others it had suppressed including tribal, peasant and other forms of knowledge.

[7] See E.E. Leppik, 'The Life and Works of N.I. Vavilov', *Economic Botany*, 1969, 23, pp. 128–32, p. 129.

[8] Sullivan, 'The Death and Rebirth of Science', in Salisbury, *The Soviet Union*, p. 285.

Thirdly, the Vavilov zones raised issues about nature. What was modern man's attitude to nature? Was nature to be conceived as a form of heritage or a piece of property? What could be the life-saving attitude in science to nature as the great experiment?

One must admit there was a certain innocence to Vavilov. He is not grouped in the rapacious list of colonial plant hunters though his was the biggest scientific collection in history. Today, this kind of collection is no longer possible. 'When Jack Harlan visited the Cilician Plain in Turkey in the 1940s the area bore virtually thousands of flax land races. When he returned in the 1950s, only one variety remained–and that was imported from Argentina.'[9] This raises another set of questions. Has the Vavilov map inadvertently created a new generation of plant hunters? Is Vavilov's theory of the zones of diversity a new map for the panopticization of the globe, where the reserves sustain gene-pools while the world around them succumbs to monoculture?

The question of gene diversity has shown science at its self-reflective, tragic best. It raises an array of problems about time, knowledge, property, efficiency, justice and nature not as extraneous issues but from within the structure of the paradigm itself. An anthology of essays on gene diversity would have to select from the works of outstanding scientists like Edward Wilson, David Ehrenfeld, Peter Raven, Richard Levins, Cary Fowler and Daniel Janzen. In examining this vast literature, the question I want to ask is a more limited one: how far can science at its self-reflective best go to create an ecological science? Note, I do not say a science of ecology, for that would only be a sub-discipline within the overall disciplinary and disciplining categories of science like biophysics or radio-astronomy. Can we have an ecological science that can challenge and rework the categories and organizations of modern science as it exists?

The remaining sections of this essay are organized in the following way. The debate on gene diversity splits into two overlapping frames of forestry and agriculture. For an understanding of the forest I consider Edward Wilson's *Biophilia*[10] and Edgar Anderson's *Plants, Man and Life*,[11] as a frame to explore the relation between diversity and traditional agriculture. This is followed by a discussion on the nature of the Green Revolution. The problem of gene diversity adds to the usual questions of political economy and the wider questions about knowledge and nature. In the last section I explore what reflections on genetic loss reveal about the character of science as a mode of thought.

II

Edward Wilson is a controversial scientist and arouses an ire second only to Garrett Hardin. He cannot be wished away as a Reaganist trend in biology, not merely because he is more literate, but also because there is a deep passion and resilience to his scholarship. Wilson's *Biophilia*, while an intensely personal testament, cannot be dismissed as the extra-curricular anguish of a professional scientist.

At a time when the mysteries of science have become confined to the cosmological vastness of the universe or to the problem of infinitely small particles, Wilson's field biology operates in the middle range. It captures the magic of everydayness. We have beautiful descriptions of trees, of the leaf-cutter ant, the bird of paradise and of the intelligence of the peccary. Yet there is a sense of the scrap-book, a discreteness of information, where a feel of the totality of the forest is somehow lost.

The forest is not a 'dwelling' in the Heideggerean or even tribal sense. Wilson inhabits the forest but does not dwell in it, nurturing it, preserving it or merely watching it unfold: he inhabits it as a field biologist. The forest as a whole does not exist. One senses that before he has even entered it, it has already been resolved into a cluster of research programmes.

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[9] Pat Roy Mooney, 'The Law of the Seed: Another Development and Plant Genetic Resources', *Development Dialogue,* 1983, 1–2, p. 13. (Entire issue devoted to Mooney's writings on The Law of the Seed.)

[10] Edward Wilson, *Biophilia* (Cambridge: Harvard University Press, 1984).

[11] Edgar Anderson, *Plants, Man and Life* (Berkeley: University of California Press, 1967).

In *Biophilia*, there is a split-level sense about the loss of the forest. There is, first, the danger to man's biological need for the forest, and there is also the threat to the constant advance of science. To scientists like Wilson, the forest is literally a magic well from which science can draw endlessly. The forest is information. Wilson states, 'One lump of earth contains information that would just about fill all fifteen editions of the Encyclopaedia Britannica.'[12] Yet there is a narcissism here, for a few pages later he claims, 'In a tropical forest, with thousands of mostly unknown species all around, the number of discoveries per investigator, per day, is probably greater than anywhere else in the world.'[13] The starkness of the scientific hubris is always present; what Wilson adds to it is the loss a field biologist feels for the forest it adds to his hubris, a sense of heroism.

One intuitively feels—I admit I might be a bit unfair—that Wilson suffers from what the philosopher Richard Bernstein has called 'Cartesian anxiety',[14] the immediate need for opening the forest or any other object to the scientific eye. The way a scientist reads the forest immediately cuts it into the certainty of a series of visual fields through map, survey, census, hand-lens and the microscope. Wilson claims: 'I open an ant hill like a Swiss watch, I am enchanted by the intricacy of its parts and the clear throbbing precision.'[15] Secondly, what appears as a series of discrete bits of information is then organized in a giant information system called science. The loss of the forest punches a series of gigantic holes into this cybernetic system. Between the cybernetic frame and the Cartesian eye the sense of the forest (despite the eloquence of the language) gets lost.

Wilson loves the forest. But the forest he loves is the 'wilderness' hopefully untouched by man and history. Its only biography is the long story of evolution. Nature as wilderness is then juxtaposed with the city which finds 'lawn grass, potted plants, caged parakeets, puppies and rubber snakes inadequate'.[16] Man needs nature and this need for nature, when programmed epigenetically, Wilson calls Biophilia. The greatest threat to Biophilia is the remorseless destruction of genetic and ecological diversity.

In fact the boldest and most dramatic statement on the problem of gene diversity is Wilson's. He states:

> Everyone agrees, defense ministers and environmentalists alike, that the worst crisis possible is a global nuclear disaster. If it occurs the entire human species is endangered, life as normal human beings wish to live it would come to an end. With what terrible truism acknowledged, it must be added that if no country pulls the trigger the worst thing that can happen—in fact is already under way—is not energy depletion, economic collapse, conventional war, or even the expansion of totalitarian governments. As tragic as these catastrophes would be for us, they can be repaired in a few generations. The one process that will take millions of years to correct is the loss of genetics and species diversity by the destruction of natural habitats. This is the folly our descendants are least likely to forgive us.[17]

In cataloguing this destruction, scientists have produced an obituary that sounds like a census. Wilson notes that the current rate of extinction is a thousand species a year. By the 1990s the figure is expected to rise to ten thousand species a year (a species an hour). During the next thirty years one million species could be erased.

The question we must ask is how do scientists perceive this fact of death, this everydayness of extinction. Reading the literature one notices that science has no mourning rituals. Caught in the credo of objectivity, impersonality and number, it hides grief in arithromorphism. Somehow the scientist seems to feel that the litany of number can be a substitute for mourning rituals. Maybe this has to do with the current preoccupation with civilizational death. Time and collective death in western industrial society intersect in the vision of the apocalypse.

Such a view is captured in a famous magazine cover, that of the *Bulletin of the Atomic Scientists*. It portrays a clock with the hour hand at twelve. The minute hand stands a few minutes from twelve, conveying the imminence of extinction. Depending on the event—the Cuban missile crisis, SALT, Perestroika—the minute hand on the cover of that particular issue is moved back and forth.

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[12] Wilson, *Biophilia*, p. 16.

[13] Ibid., p. 28.

[14] Richard Bernstein, *Beyond Objectivism and Relativism* (Oxford: Basil Blackwell, 1983), p. 16.

[15] Wilson, *Biophilia*, p. 36,

[16] Ibid, p. 118.

[17] Ibid., p. 121.

The ability to calibrate time gives one a sense of control. In fact, this juxtaposition of clock time, apocalypse and number is typical of the risk cultures of today. It somehow embodies a notion that numbers can divide time and measure risk and that even an atomic experiment or one in genetic control can be a calculated risk. A parade of numbers hides both the irresponsibility and the ignorance. Scientific time has swung too often between mechanical time and apocalyptic time, between the ahistorical and history's end. The problem of gene diversity moves beyond the time of mechanistic physics and introduces a variety of other times, emphasizing in particular the intersection of evolutionary and historical time. Peter Raven remarks: 'Not since the end of the cretaceous period, 65 million years ago, has such a rate of extinction occurred; it has been calculated that the process of extinction is about 1000 times higher than during the past million years.'[18]

It is the problem of time that becomes fundamental to ecology. Ecology demands an unravelling of the various kinds of time in science and various kinds of time concealed in concepts like extinction, death, obsolescence, memory, particularly in terms of how science conceives nature and other cultures.

The debate on gene diversity is a typical 'futurological' exercise, ambivalent, even contemptuous about the past, yet scavenging off it. Probably the simplest way of understanding it is by contrasting the polysemic richness of the word 'seed' with the semantic impoverishment of the word 'gene'. The seed is one of the richest and most pregnant metaphors of modern man. The seed is memory, the seed is the past, it is tradition and also the future as a responsibility. If the seed is memory, then the gene is information. The logic of language is noticeable here. You can talk of the death of the seed, but merely of the obsolescence of information. The basis of modern science is not memory, embedded in life forms, but information subject to constant erasure. If ecology is to survive, it must fight a life and death struggle against concepts such as obsolescence, a notion of time encoded in the market and in many domains of science. The word obsolescence is anti-traditional, linear, splitting life and death into separate systems rather than seeing them as integrated processes. If the seed is embedded, then information is abstract and science as a knowledge system thrives on obsolescence, a modern kind of forgetting, privileging one kind of knowledge against all other forms.

Once the tropical forest is seen as an information system, its process of extinction becomes easier. Once information is abstracted, classified and filed, the forest as a life-form may even disappear. This contrast between the forest as information and the forest as a dwelling, a presence, a memory, may provide a key to how scientists have looked at the destruction of the tropical forest. Someday one should compare a tribal view of the forest with Wilson's perception of it. There is poetry in the latter, even guilt and loss, but eventually such an attitude loses out to its intrinsic scientific verve. In fact, the sense of tragedy at the death of the forest is always vitiated by the 'narcissism' of science seeking to collect the last plant like the anthropologist pursuing the last savage. Peter Raven of the Missouri Botanical Garden observes with the delicate care of a curator that 'In collecting plants in the tropics, we should be aware that in many cases they may be obtaining the last samples of a given species that may be gathered. Unlike curators of art or historical material, biologists rarely regard the preservation-conservation of their specimens as a matter of much importance. Implicitly they operate as if there is always an abundant supply of material in the field ready to be obtained when it is needed, when regrettably that is not the case.'[19] It is this museumization of life forms that is ingrained in science, where the Other as nature or as culture is presented as disembodied and abstracted from context. The museum is the recognition of the Other but always through the smell of formaldehyde.

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[18] Peter Raven, 'Tropical Floristics Tomorrow', *Taxon*, 1988, *37(3)*, pp. 549–60, p. 554.

[19] Ibid., pp. 556–7.

One must admit that this framework is slowly weakening. Robert Leo Smith has observed: 'The bare accumulation of data does not advance the cause of conservation and there is danger of believing it will. For a few species we have accumulated considerable quantities of data, which now rests in books and journals, while the species themselves have ceased to exist.'[20]

In his *Biophilia* Wilson shows that man needs nature and recreates 'primordial' memories of nature repeatedly even in the backyards of the city.[21] Since nature is an evolutionarily determined need, Wilson speculates on the possibility of a conservation ethic. Following Aldo Leopold, Wilson defines an ethic as 'a set of rules invented to meet circumstances now new and intricate, or else encompassing responses so far in the future, that the average person cannot foresee the final outcome'.[22] Such an ethic must be biologically rooted and seek a kinship with nature. He cites Darwin's notebooks in another context as saying, 'He who understands the baboon would do more for metaphysics than Locke.'[23] Yet the 'kinship' he posits towards nature is of a contractual kind, despite the moving section on his encounter with the almost human chimpanzee, Kanzi. He suggests that the work of Christopher Stone[24] and Peter Singer[25] about plant and animal rights be given a wider hearing. Yet as a biological realist he retreats into a oneness with Garrett Hardin in contending that the facts of biology do not allow the circle of altruism to easily include plants, animals or even future generations. 'The only way to make a conservation ethic work is to ground it in ultimately selfish reasoning—but the premise must be of a new and more potent kind.'[26] He warns, 'Ecological and evolutionary time are intellectualist constructs without immediate impact',[27] because 'natural selection has programmed people to think mostly in physiological time'.[28] Acute as Wilson or Hardin are at the level of biology, they get trite beyond it. Their celebration of nature contrasts with the bleakness of their cultural categories restricted to utility and contract. Biophilia, to survive, has to move beyond the facts of biology. One is doubtful whether eco-piety or an ecological ethic can be constructed out of the poverty of sociobiology alone.

Yet Wilson has wise and interesting ideas to offer. He suggests that 'A conservation ethic can develop not as a code from absolute premises but in the manner of common law, with the aid of case histories.'[29] Another intriguing observation is the one he offers about science. Wilson proposes a new division of labour between the first and third worlds, stemming not out of cultural differences but from economics.

> The exploration of natural resources is the kind of research most readily justified in the underdeveloped countries, especially those in the tropics... while these nations occasionally need accelerators, satellites, mass spectrometers... the economically less developed countries can do better with skilled and semi-skilled workers who make expeditions into the wild, collect and prepare specimens, culture promising varieties and spend the long hours of close observation needed to understand growth and behaviour. This kind of science is labour intensive, best performed by people who love land and organisms for their own sake.
>
> Can there be a Ecuadorian biology, a Kenyan biology? Yes, if the focus is on the uniqueness of indigenous life. Will such efforts be important to international science? Yes, because evolutionary biology is a discipline of special cases woven into global patterns, nothing makes sense except in light of the histories of local faunas and floras.[30]

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[20] Robert Leo Smith, 'Ecological Genesis of Endangered Species: The Philosophy of Preservation', *Annual Review of Ecology and Systematics*, 1976, 7, pp. 33–5.

[21] Wilson, *Biophilia*, pp. 94–5.

[22] Ibid., p. 120.

[23] Ibid., p. 47.

[24] Christopher D. Stone, *Should Trees have a Standing? Towards Legal Rights for Natural Objects* (Los Altos: William Kaufman, 1975).

[25] Peter Singer, *Animal Liberation* (London: Jonathan Cape, 1975).

[26] Wilson, *Biophilia*, p. 131.

[27] Ibid., p. 120.

[28] Ibid., p. 120.

[29] Ibid., p. 124.

[30] Ibid., pp. 137–8.

One could easily get disturbed about Wilson's socio-biology and his theory of comparative advantage in science. But can we subvert the idea without losing a sense of the centre-periphery model within which it is articulated? I believe so. Firstly, we must note that Wilson rarely mentions indigenous systems of knowledge. He does not realize that other cultures have different ways of looking at the forest and nature. What if the forest is not 'wilderness' in the American sense but a dwelling for communities who have lived in and understood the forest? Maybe they are better stewards, than our scientists. What if the ecumenicism of science is actually broken into a plurality of sciences? What if gene diversity needs a diversity of knowledge forms? What if western science were to use the assumptions of these alternative life forms for its research programmes? These questions will arise repeatedly in the following discussions.

There is one final point one must make about *Biophilia*. Basically Wilson's science, like his Judeo-Christian framework, finds it difficult to abandon a humanism which sees man as the goal and centre of creation/evolution. While Wilson is embarrassed by man and his destructive capacities he remains proud of the power that science has created. He remarks sadly that 'The wilderness of the world has shrivelled into timber leases and threatened nature reserves',[31] yet claims, 'nature is to be mastered but (we hope) never completely. A quiet passion burns not for total control, but for the sensation of constant advance.'[32]

Wilson's is a humanism that does not fully encode the need for caring in the will to power. As a result, the notion of stewardship he proclaims dangles helplessly and this is partly why his *Biophilia* remains a plea for a science of ecology but not an ecological science. A humanism based on interest alone cannot go too far. Eventually he sees the forest as a paradise for the food and pharmaceutical industry. When natural products are the sleeping giants of the pharmaceutical industry,[33] nature immediately becomes a resource; in fact the metaphor is that of a mine with its spoils to be dug up. It is this transformation of nature into 'resources' that humanism has not been able to contain. What Wilson notes delicately as a concerned and passionate scientist, a multinational like Anaconda would state brutally with even greater aphoristic power:

> Nature creates ore deposits
> Anaconda creates mines.[34]

It is this mining of the forest that Wilson's *Biophilia* is powerless to stop.

In the next section we shall examine Edgar Anderson's attempt to reflect on agricultural diversity.

III

Despite its deceptive simplicity, Edgar Anderson's *Plants, Man and Life* is probably one of the finest scientific reflections on agriculture. To appreciate Anderson's book, we have to understand that there have been three major revolutions in agriculture, the first of which began about 10,000 years ago. The second took place roughly over the last hundred years and the third is occurring at the present moment. Yet what has been described diachronically must be read synchronically, for the inheritors of the three revolutions exist now in the same time and place. Anderson writes as a participant of the second revolution reflecting on the first. The experience is similar to a post-Newtonian scientist discovering the world of Ptolemy and Aristotle and realizing that they were also right. To do this, Anderson confesses that one must move beyond the ethnocentricism of specialized science and the worldview of Europeans and Americans 'too accustomed to thinking of agriculture in terms of one kind of plant, of one variety of wheat... of one hundred acres of maize all of one variety and weed free'[35].

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[31] Ibid., p. 11.

[32] Ibid., p. 10.

[33] Ibid., p. 133.

[34] Harold Alderman, 'Heidegger's Critique of Science and Technology', in M. Murray, *Heidegger and Modern Philosophy: Critical Essays* (New Haven: Yale University Press, 1978), pp. 34–50, p. 46.

[35] Anderson, *Plants*, p. 84.

Anderson observes that the end products of agriculture are artifacts and these artifacts, called cultigens, are as dependent on man for their continued existence as 'a temple or a vase or an automobile'.[36] These crops, man, and his beasts constitute a mutually dependent but unnatural complex of beings. The standard example cited is the maize. Its female inflorescence, a pathological characteristic, has no equivalent among grasses, and if man were to stop planting it, it would disappear within six years. All known living maize, the world's third most important crop, is dependent on man for survival.

Anderson emphasizes that while all agriculture is a disturbance of nature, each agricultural revolution disturbed nature in a uniquely different way. The first helped catalyse nature's diversity and then operated by mimicking nature as far as possible. The later revolutions found nature unacceptable: the second sought to transform parts of it through mechanization and fertilizers, while the third attempted to rewrite nature by reconstructing genetic architecture in a laboratory.

The radicalness of the first agricultural revolution is captured succinctly by Erna Bennett:

> Just as the chemical activity of a substance is enormously enhanced by the reduction to colloidal dimension, so the greatly fragmented patches of cultivation created by man enhanced the genetic activity of the plants he cultivated and the plants that mingled with them. The patchwork of cultivation sown by man unleashed an explosion of hybridization and a flood of evolution that found expression in literally inestimable numbers of new races of cultivated plants and their relatives. Nowadays in an age when weedy fields and fragmented cultivation have yielded to wide expanses of uniform cultivars, we cannot hope to repeat this experiment. Its products, the evolutionary consequences of a unique genetic explosion are the principal component of our genetic resources today.[37]

Anderson's book is a celebration of the innovative genius of the first agricultural revolution, a recognition that the later revolutions

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[36] Ibid., p. 9.

[37] Erna Bennett, 'Threats to Crop Plant Genetic Resources', in J.G. Hawkes (ed.), *Conservation and Agriculture* (London: Duckworth, 1978), pp. 113–22,144.

are still scavenging off the first. He emphasizes the continuity of innovation in traditional agriculture. It is not the eponymic work of individual scientists but the work of generations of farmers working in communities. He savours major moments in it like the American celebration of the sweetcorn and the Italian discovery of the tomato which was historically as 'important as Garibaldi or Victor Emmanuel'.[38] He cites his old teacher Ames Oakes as observing that 'Primitive man located all five natural sources of caffeine: tea, coffee, the cola plant, Yerba maté and its relatives... and that biochemical research has not added a single new source.'[39]

I listed three examples not to perform a Ripley's *Believe It or Not* but to emphasize the innovativeness of agriculture and also to suggest that it operates in terms of a different framework of understanding. The word diversity comes closest in contemporary science to grasping it but as a philosophical idea it must mean more than the mere existence of variety of a genetic or ecological kind. Diversity, like entropy, is an antiseptic but world-shattering concept. If entropy demolished the world of mechanistic physics and provided a virtual theology of limits to modern industrial civilization, diversity, if unravelled, might lead to a virtual recovery of the agricultural worldview within modern science. Apart from occasional and long surviving monocultures like those of Java, the notion of diversity virtually encodes traditional agriculture at several levels.

Probably the easiest introduction to this alternate life world is Anderson's classic description of the Guatemalan garden, which he first thought was 'a dump heap the size of an American city lot covered with such riotous growth, that it appeared planless and deserted to those accustomed to the puritanical primness of North European gardens'.[40] Yet, when he went through it carefully he could find no plants which were not useful, in one way or another. There were no noxious weeds, and the return per man hour of effort was high. I shall quote Anderson in detail:

> Though at first there seemed little order, as soon as we started mapping the garden, we realized it was planted in fairly definite cross-wise rows. There

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[38] Anderson, *Plants*, p. 110.

[39] Ibid., p. 127.

[40] Ibid., p. 137.

were fruit trees, native and American in great variety: annonas, cherimoyas, avocados, peaches, quinces, plums, a fig and a few coffee bushes. There were giant cactii grown for their fruit. There was a large plant of rosemary, a plant of rue, some poinsettias, and a fine semi-climbing tea rose. There was a whole row of the native domesticated hawthorn, whose fruits like yellow doll size apples make a delicious conserve. There were two varieties of corn, one well past bearing and now serving as a trellis for climbing string beans which were just coming into season, the other a much taller sort which was tasselling out. There were specimens of a little banana with smooth wide leaves, which are the local substitute for wrapping paper, and are also used instead of cornhusks in cooking the native variant of hot tamales. Over it all clambered the luxuriant vines of the various cucurbits. Chayote when finally mature, has a large nutritious root weighing several pounds. At one point there was a depression, the size of a small bath tub where a chayote root had recently been excavated; this served as a dump heap and compost for waste from the house. At one end of the garden was a small beehive made from boxes and tincans. In terms of our American and European equivalents, the garden was a vegetable garden, an orchard, a dump heap, a compost heap and a bee yard.[41]

Anderson's note on the Guatemalan garden serves as a text for which the rest of the book becomes a series of fascinating footnotes. They reveal that diversity is not the mere presence of variety; it virtually encodes the grammar of traditional agriculture.

Diversity first of all demands an understanding of the multidimensionality of natural processes. C.H. Waddington has observed that both the inputs and outputs of the natural process are extraordinarily complex.[42] Traditional agriculture mimicked this multidimensionality, the classic examples being the maize-bean-squash complex of Central America, the elaborate systems of mixed cropping in India or even the Guatemalan garden where a multiple canopy of plants was created to exploit every available niche. Waddington bemoans the fact that multidimensionality is mere noise to the world of modern science and the intellect.[43] It is essential to note that this agriculture is multilayered both in terms

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[41] Ibid., p. 140.

[42] Waddington in 'Summary of Discussion Part VI' in Hawkes, *Conservation*, p. 248.

[43] Ibid., p. 248.

of space and time. First, as in the Guatemalan garden, along with the fruit tree, several other kinds of crop are grown adding to several canopies of crop on the same piece of land. Not only is there the multidimensionality of several kinds of plants and several varieties of the same plant in one space (multiple-cropping), there is also multidimensionality in time through crop rotation. So successful in imitating nature are these gardens that often such native orchards have been mistaken for part of natural woodlands by European and American plant collectors![44]

There is a second kind of multidimensionality in agriculture where a crop is never conceived purely in the economic dimension. It is always part of a wider agricultural complex cutting across several frames. A plant cuts across the world of magic, science and religion, work, play, music and medicine. It is precisely this multidimensionality of the plant that provides the sources of resistance to monoculture. The kind of selective harvesting mixed cropping requires is also impossible with the machine. It is interesting to note that modern scientists are tapping these very sources of resistance—the sacred complex of the American maize, the sunflower dance of the American Indian, the sacred groves of India—for sources of gene plasm.

Thirdly, a plant is never conceived purely as a plant. Just as a car cannot be conceived without simultaneously thinking of an energy system, a system of roads, possibly even a system of advertising it, in a similar way it is incorrect to think of a plant as an isolated unit. It has to be thought of as being in harmony with nature. As Aldo Leopold asked, 'Is it sound economics to think of any plant as a separate entity, to proscribe or encourage it on grounds of individual performance? One has to think of what its effect will be on animal life, on the soil, on the health of land as an organism.'[45]

Diversity also involves multiplicity of uses. This means not only a multiplicity of uses for the same plant, but the use of the plant, or a part of it, through every stage from seed to final maturation.

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[44] Anderson, *Plants,* p. 143.

[45] Aldo Leopold, *A Sand Country Almanac* (New York: Ballantine Books, 1973), p. 195.

Probably the two best examples one can think of are the coconut and the maize. Sigmar Groeneveld[46] makes a devastating analysis of how modern economic botany and tropical agriculture have thought of the coconut. Treatises in economic botany define the coconut purely as an oil-yielding plant. Yet Groeneveld shows that the coconut is an integrated plant of rural culture with over a hundred uses of which there are little national and international statistics. He adds that the coconut is not just the tree of life, it is a way of life, and to call it a mere coconut blinds one to the emotional and moral economy of the plant, to uses which are built into the very life cycle rituals of the society.[47] In fact he makes a second fascinating link between use and language usage. The uses of the coconut cannot be appreciated through the language of economic botany. One must go beyond secular language and the shopping lists of modern science to the polysemy of native terms where there is a real celebration of diversity. In fact it is this (ethno-botanical) usage that captures the complexity of diversity otherwise lost in the aridity of economic botany.

Carl Sauer makes the same point for maize, which in America is conceived mainly as feed for livestock. It was only native Indians who conceived it as food, adapting it to native diet and local soils. As a result while only a small part of genetic wealth is preserved in commercial corns, it is the local grower who has sustained the enormous diversity of maize. It is not accidental that a single native village may contain more kinds of maize than the corn belt has ever heard of, each having a special place in the household and field economy, and it is to these American Indian varieties that geneticists turn when they have to understand maize as a species complex.

Diversity in traditional agriculture also involves a framework of attitudes to weeds, disease and risk. Anderson remarks that the attitude to weeds is one of the rorschachs of modern science. For most taxonomists a weed represents something ubiquitous, mundane

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[46] Sigmar Groeneveld, 'Lessons from the Tree of Life in the Context of Economics and Development', in Bernhard Glaeser (ed.), *Ecodevelopment: Concepts, Projects, Strategies* (Oxford: Pergamon Press, 1984), pp. 45–58.

[47] Ibid., p. 46.

yet irritatingly unknown. Anderson cites the case of a famous taxonomist with an almost encyclopaedic knowledge of the flora of Asia and the South Pacific, with the reputation of being able to name more species by sight than any American taxonomist. 'Yet when confronted with plants associated closely with man, he would mutter "pantropic weed" and throw it into the waste basket.'[48] It is interesting that in science a weed is defined as 'a plant out of place'[49] and there is even legislation banning certain forms of weeds in farms. The taxonomist's attitude reflects the attitude of clear farming agriculture which celebrates the weedless field. Yet the history of weeds is virtually the history of modern agriculture and it is only today that scientists are realizing the creative role of weeds. Anderson cites the fact that modern sugarcane came into being through a series of crosses between weedy grasses: 'Modern sugarcane breeders are now using one of India's greatest pests (sic), the Khas grass, in turning out improved varieties of cane.'[50]

Traditional agriculture has been a celebration of the weed. It realized that nature knows no plants as weeds and left the boundary between weed and cultivated crop more open. This comes out clearly in Ugent's study of the Andean potato.[51] Ugent emphasizes that while the traditional farmer devoted considerable care to the preparation and planting of the field, he was relaxed, almost indifferent to the presence of wild and semiwild (weedy) potato species that grew in between the rows of potatoes and even in the thickets around it. As a result these wild-weedy species not only flourished but hybridized with the crops.

The quiet wisdom of this move has two consequences, both of which are important for the perpetuation of the Andean potato. The hybridization of wild and weedy species with cultivated plants created not only greater cultivar diversity, but provided for resistance against disease and adaptability to climatic changes. Secondly, these fields constitute natural gene pools, a legacy that modern agriculture, committed to clean farming and monoculture, can draw upon. Homogenous or uniform potato fields are more prone to disease. Ugent speculates that the Irish potato famine of 1845 might have been avoided if the fields had been planted with many different cultivars with varying degrees of resistance or susceptibility to disease.[52]

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[48] Anderson, *Plants*, p. 35.

[49] Ibid., p. 73.

[50] Ibid., p. 73.

[51] Donald Ugent, 'The Potato', *Science*, 1970, *170(3963)*, pp. 1161–5; p. 1161.

It is as a method of insurance against crop failures that the system of mixed cropping finds its greatest justification. Diversity, both interspecific and intraspecific, provides insurance against the inclemencies of weather, pests and diseases. In sustainable agriculture there is, in general, a dynamic balance between host and pathogen. Yegna Iyer in his classic monograph on mixed cropping notes that 'the insurance afforded by mixtures in respect of wilts and rusts especially is worthy of notice'.[53] Perhaps the best illustration is the castor semi-looper pest that defoliates the crop thoroughly leaving only the bare stem: 'A mixed crop of horsegram and groundnuts when grown as a mixture between castor rows serves as an effective insurance as they yield a crop and money return although the castor may be a complete failure.'[54] Varietal cropping thus guarantees the farmer food at all times. Even if some plants failed to germinate or others became susceptible to disease, the overall harvest is enough to sustain the farmer.

Varietal cropping also guaranteed a balanced diet in traditional agriculture. In almost all mixed cropping systems in India both foodgrains and pulses are included in the diet of the population. There is always wheat and gram, castor and horsegram, or *bajra* and groundnut; but whatever the combination, the main cereals grown in the tract are always supplied by the main protein supplement 'with other grain and pulse crops which are grown to a smaller extent providing the appropriate variety in diet'.[55]

Anderson's reflections on the wisdom of agriculture reads like a slow rewind. The story of the latter two agricultural revolutions appears in fast forward. He has little to offer on these two except two statements which capture deep tensions.

He remarks that while agriculture as an art began in the tropics, the scientific understanding of agriculture developed in the temperate zones and the tragedy lay in the imposition of one life world on the other. He confesses that when an agricultural scientist goes to the tropics, he has more to unlearn than to teach. Yet his last chapter is a disturbing one, for Anderson, like many scientists, has a naivete, 'an immaculate innocence', while pursuing knowledge. He talks enthusiastically about the need to study common weeds, ornamentals and crops and his dream of building a herbarium of specimens to catalogue and understand this diversity. He bemoans the lack of money needed for such an enterprise and adds that as a Quaker he always felt 'a way will be opened'.[56] Eventually he managed to establish such an enterprise in Latin America, with the help of Escuela Agricola. 'A remarkable institution',[57] set up to bring about 'the rational development of natural resources in Latin America',[58] it was established by the United Fruit Company!

In the next section I will turn to a discussion of the second and third agricultural revolutions.

IV

David Selbourne, in an essay somewhere, makes a distinction between the world of life and the world of the book. This essay on gene diversity is a fragment of the second. The major critique of the Green Revolution will come from the world of life, from peasants, tribals, ecologists and other third world activists. The questions I have asked are more modest and stem from a reading of books on the Green Revolution. Rather than replicate its elaborate histories or critiques derived from theories of political economy, I ask simpler questions. I regard the archives of the Green Revolution as particular kinds of narrative and ask what the

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[52] Ibid., p. 1165.

[53] A. Yegna Iyer, 'Mixed Cropping in India', *IARI Bulletin*, 1949, *19(1)*, pp. 439–543; p. 473.

[54] Ibid., p. 473.

[55] Ibid., p. 483.

[56] Anderson, *Plants*, p. 223.

[57] Ibid., p. 224.

[58] Ibid., p. 224.

conditions, the basic elements, are that constitute any official narrative of the Revolution. What are the stock situations that go into the making of that 'modern fairytale', the Green Revolution?

The Green Revolution possesses at least five stock elements without which no narrative is possible. The first consists of a false history of the Other, especially conceived as the tropics. The second is what one might call the recalcitrance of nature and the need to rationalize it through industry.

Thirdly, the act of diffusion is seen as philanthropy where the Taylorization of agriculture is justified as good science. Incidentally the scientist is never seen as an epic hero, liberating us from old epistemes, but merely as a facilitator providing one more avenue for productive agriculture. This demands in turn an attempt to dissolve the embeddedness of agriculture as a system by celebrating or privileging some form of economic calculus. Finally, there is what I call the myth of constant advance. The Other as nature or agriculture is never totally controlled. New problems arise which once again need science.

Diversity in terms of the above constitutes a mode or site for resistance that needs to be made redundant or eliminated. Any attempt at recovering the category of diversity must begin by deconstructing the above assumptions.

The World of the Tropics

One must begin with the false history embedded in the construct called 'Tropical Agriculture' and also reflected in manuals of economic botany. Sigmar Groeneveld once again provides a superb example. He remarks that the 'tree of life', the coconut, has been a part of traditional agriculture for millennia, its repertoire of uses cutting right across the cosmology of traditional life. Yet the semantics of modern economic botany and tropical agriculture project an entirely different picture. He considers a scientific study, Franke's *Useful Plants in the Tropics and Sub-tropics,* to explore the tacit knowledges of tropical agriculture.[59] Franke contends that 'Although the coconut palm has been cultivated on an economic basis, little has been done up to now to cultivate this valuable oil plant systematically. Organized cultivation, care, fertilizing of new varieties were not given somewhat greater consideration until the past decades.'[60] Groeneveld observes that such a text was not a mere colonial tract but a scientific manual and then explores the various forms of distortion and reductionism that this involves.

Consider first the word 'cultivation'. It has a Eurocentric bias. It assumes that the term 'cultivation' cannot apply to the way in which the coconut palm has been grown in the tropics for centuries.[61] Consider next the word 'economic plant'. An entire cosmology, a celebration, is reduced to a single grid–an economic plant–and to a single use–oil. Thirdly, ordinary language names for the coconut are not cited. Any folk poem on the tree of life would have a more accurate celebration of its uses. Fourthly, the coconut is still nature, it enters history and science through the 'organized care, fertilizing and breeding'[62] of tropical agriculture. The process of abstraction becomes obvious here, for not only does the term rob the plant of its full significance, it transforms an icon into an economic index. Groeneveld notes that there is hardly any reference to the ecological significance of traditional cultivation methods, to the fact that the coconut creates around it a microclimate. Under and around grow the farmers' maize, peas, beans and cassava. Once the coconut is seen as a disembodied category, isolated from its myriad traditional uses and the innumerable plants that grow around it, it is further opened to the clinical gaze of modern agriculture. It is as if the plant is moved from the field to the laboratory table. The predictable diagnosis is then the need for the dwarf palm, a quick growing, short trunked variety of the plant.

Groeneveld remarks that the request for the dwarf palm did not come from traditional growers. It was possibly a plea from plantation growers who, impatient with labour, wanted such a product. Such an industrial product created a preference for monoculture as it allowed for more 'systematic' harvesting. But the dwarf palm destroyed the traditional microclimate around the plant as it lacked the height of the traditional plant, under which cashews, bananas, manioc and other crops grew so well.

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[59] Groeneveld, 'Lessons from the Tree of Life', in Glaeser, *Ecodevelopment,* p. 47.

[60] Ibid., p. 47.

[61] Ibid., p. 47.

[62] Ibid., p. 47.

Groeneveld suggests a final point, that nowhere in Franke's manual are his basic assumptions clearly articulated. One wonders whether Franke's manual, like other tracts of agriculture, is as much a part of an imaginary science as Lysenkoism. Is tropical agriculture becoming such a science?

Agriculture into Industry

The fundamental threat to agricultural diversity comes from a worldview that privileges industry over agriculture. Cedric Stanton Hicks has observed that underlying the Green Revolution is a carryover of unexamined assumptions from the eighteenth and nineteenth centuries, that industry is the essential means to prosperity, that people engaged in agriculture must move to factories, that small farms must be merged into large farms and that agriculture must be converted into 'industry'.[63] The controlled fury of the narratives of the Green Revolution comes from impatience with nature and its refractoriness to industrial time.

The first assaults against agriculture failed to convert it into an industry. What they did was to appropriate sectors of agricultural life. Through mechanization, various parts of the labour process, particularly tools and instruments, were replaced. Thus the broadcast seed yielded to the drill, the horse to the tractor. The second major revolution came through the production of synthetic fertilizers. But neither the mechanical nor the chemical revolutions affected the basic biological processes of agriculture or its repertoire of diverse performances.[64] Hicks observes that science's confrontation with agricultural diversity was full of ironies and missed chances. It was in 1887 that the German chemists Wellfarth and Hellreigel worked out the role of leguminous roots in nitrogen fixation. This memorable discovery, one of the most illuminating glimpses into the complexity of agriculture, should have had a revolutionary impact. Yet 'it lost out to the burgeoning science of chemistry more in tune with the materialist philosophy of the time',[65] and the attention focused on soluble nitrate as a fertilizer. But the greater irony came from biology itself.

Instead of celebrating the wisdom of diversity and providing the controls physics and chemistry so desperately needed, it was biology that provided the conditions for the industrialization of agriculture. The development of new hybridization techniques enabled the integration of genetic, chemical and mechanical packages into one whole.[66] The hybridization of corn made the industrialization of agriculture a distinct possibility. Through genetics, crop characteristics could be adapted to the machine. Whether it was maize, tomato or cotton, the crop could be designed as a standardized hardware to be picked and harvested by the machine.

To the compact between the genetic and the mechanical was added another contract with the chemical, as fertilizer and herbicide. Traditional agriculture was never too responsive to fertilizers. Large intake of fertilizers caused excessive growth of the stalk and plant collapse. What one needed was a plant that was higher yielding but responsive to fertilizers. This was the achievement of the Japanese imperial experiments in Taiwan. The Japanese agricultural experiments created a seed that was a virtual sponge for fertilizers. Calestous Juma points that 'while the average Japanese rice yield increased almost 50%, artificial fertilizer use increased by 254%'.[67] This integration of the genetic, chemical and mechanical packages produced the star for the Green Revolution programme, the HYV, an alleged seed that could produce a short stemmed, stiff-strawed variety of rice, strong enough to carry a heavier grain cluster, which could be harvested mechanically and yet be responsive to fertilizers and herbicides. The other major invention required was a method of altering the photosensitivity of the plant so that it could mature in a definitive period unaffected by local variations in climate or day length. Once the biological time of agricultural transformations was reduced, labour time and biological processes could be synchronized, bringing agriculture close to industry. Stanton Hicks notes that the possibility of diversity in agriculture is doomed as long as modern economics and science fail to accept the difference between industry and agriculture. Diversity can only emerge when an agricultural view of life is recovered. Hicks sees this as the major quest for modern science.

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[63] See Cedric Stanton Hicks, *Man and Natural Resources* (London: Croom Helm, 1975), Chs. 5 & 6.

[64] See David Goodman et al., *From Farming to Biotechnology* (Oxford: Basil Blackwell, 1987), Chs. 1 & 2.

[65] Hicks, *Man and Natural Resources,* p. 88.

[66] Goodman, *From Farming to Biotechnology,* pp. 33–48.

[67] Calestous Juma, *The Gene Hunter: Biotechnology and the Scramble for Seeds* (London: Zed Books, 1989; also Princeton, N.J.: Princeton University Press, 1987), p. 78.

The Economics of Destruction

There is another point one immediately notices about the narratives of the Green Revolution. It is always portrayed as 'logical and inevitable'. Additionally, when critics accuse the executives of the Green Revolution of failure or corruption, the responses of the latter always come out as 'technical answers to technical questions'. I think these definitions must be taken seriously. The Green Revolution represents the extension of accountancy and instrumental reason to agriculture. The scientists no longer feel responsible because they are strictly 'appliers of formulae and recipes'.[68] The Green Revolution scientist is not an episteme breaker like Galileo, he merely extends the domain of cognitive and instrumental reason. New problems do create ethical problems but these merely necessitate technical fixes. The rationality of the Green Revolution is of a kind that does not allow for self-reflection. Both resistance and critique and heroism lie in languages and in the worlds beyond it.

A part of the 'inevitability' of the Green Revolution is its Taylorization. What inaugurates the Taylorization of agriculture is the hybrid seed. It not only facilitated monoculture but created in addition a monoculture of knowledge. Hybridization reduced the viability of seeds over generations. This ensured that every season the farmer had to return to the breeder for seed.

Calestous Juma notes, 'The adaptive knowledge that had hitherto been accumulated at the local level for dealing with a wide range of problems such as pest, drought and disease was scrapped and improved varieties came with new techniques of how to handle problems. It made the farmers less adaptive as they had no control over the knowledge related to these inputs. Whenever the new varieties failed, the farmer was left with few options but to wait for solutions from the research centres'.[69]

But the greatest ignominy is the manner in which generations of knowledge are wiped out with a classificatory stroke. The classification of gene plasm is an indication of this. Genetic resources are classified, from the viewpoint of the genetic industry, as wild species, improved land races including primitive cultivars, advanced cultivars and breeding lines, etc. The point to note is that 'primitive cultivator' is a highly biased term, and advantageous for the genetic industry as a label. The term 'primitive' hides the sophistication, the millennia of work farmers have put in.[70] Mooney adds that many of these 'primitive' varieties become modern merely by crossing the border. A stroke of the pen and cosmetic variation leads to the plant being listed as a new patent by a gene multinational.

The history of the Green Revolution becomes a Kafkaesque story. It is one where Johnny Appleseed is now a multinational. The Green Revolution is read as a modern success story. If Max Weber were to write about capitalism and science today, he would probably study the Green Revolution. His analytical focus would however be different. Instead of the Protestant as individual he would write about the bureaucrat-scientist as functional agent. Instead of citing Benjamin Franklin's *Poor Richard's Almanac* he would be citing the annual reports of the International Rice Research Institute and International Maize and Wheat Improvement Centre and referring to technocrats like Borlaug and Swaminathan. However, he would not talk of them as charismatic heroes, *Reader's Digest* style, but as functional operators applying the recipes of technical reason.

[68] Goodman, *From Farming to Biotechnology*, pp. 33–48.

[69] Juma, *The Gene Hunters*, p. 79.

[70] Mooney, 'The Law of the Seed', *Development Dialogue*, p. 56. Mooney's essay explains in great detail the ethical and legal implications of these allegedly expert classifications.

Success, for the Green Revolution, was gauged by increase in productivity and profits. Accountancy was merely interested in more or less, not in the meaning of work, the diversity of nature or the quality of life. This privileging of the quantitative had definite consequences for diversity and sustainability. Andre Gorz in his *Critique of Economic Reason* observes: 'Quantitative measure inherently admits no principle of self-limitation. The category of the "sufficient" and the category of the "too much" are equally alien. No quantity is the greatest possible, no success is so great that a greater success cannot be imagined.'[71] Gorz and Weber realized that economic calculation was a rebellion against the constricting orders of feudal society. It not only made efficiency measurable but turned it into a scientific virtue. Yet Weber was a man attuned to ironies. He might have realized that economic rationality, while a liberating category historically, might be read as destructive when confronted with the embeddedness of traditional agriculture. As the Indian feminist and philosopher of science, Vandana Shiva shows, the abstracted categories of economic calculation virtually performed a conceptual rape of agriculture.[72]

Agriculture as a conceptual system involves an interaction between plants, soil and farm animals. The reductionist Green Revolution substitute for this symbiotic interaction is a formal integration at the level of seeds and chemicals. The long range impact of the seed-chemical package is never considered in this assessment of yields. Moreover, the Green Revolution concentrates on visible short-term economics and fails to assess invisible economics. It is illiterate when it comes to measuring the ecological contribution of nitrogen fixation or the prevention of diseases by mixed cropping.

Shiva insists that instead of isolated parts it is the two systems of agriculture that must be compared.[73] She could have added that what is then compared is an impoverished innovation chain with a living chain of being which includes soil, plants, animals and man as a living covenant. What one needs to measure is the sustainability of one system against the market life of the other. Mere radical critiques from the standpoint of political economy will not suffice. To simply raise the questions about the percentage of people below the poverty line after the Green Revolution mimics the language of economic calculation.

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[71] Gorz, *Critique of Economic Reason* (London: Verso, 1989), p. 113.

[72] Vandana Shiva, *The Violence of the Green Revolution* (Dehradun: Author, 1989), pp. 37–8.

[73] Ibid., p. 38.

The Myth of Constant Advance

The history of gene diversity reveals how the dualism of power and caring is skilfully woven by science to create new spaces for policing. What appear as items for concern and crises for the paradigm are reduced to everyday problems for the next decade. The structure of science operates to create three permissible strategies in reaction to a problem. First, and this is of greatest interest to us, are the dissenting imaginations within science, the works of Ehrenfeld, Stanton Hicks, Anderson, Richard Levins and others committed to transforming Promethean science into a caring Hermes. Their danger lies in their continuous marginalization while simultaneously providing normal science with a liberal air. The second model involves the juxtaposition of hard technology with environmental concern, reflected in the writings of advocates of gene reserves like Frankel, Hawkes, etc. The third tactic is an attempt by scientists to claim that the crises created by science can only be solved by more science. Problems like pollution, disease and falling productivity rather than being mere concerns also become pretexts for opening out new spaces for science in its perpetual quest for constant advance. What appears as a philosophy of concern and caring is the opening gambit of science clearing a new space for itself, using the impending threat of scarcity or disaster to wish or wipe away questions of ethical concern. This is precisely how gene technology has approached the critique of the Green Revolution. It treats the Borlaug revolution as primitive, and presents the epigones of Watson and Crick as the real revolutionaries. The new techniques of recombinant DNA or even tissue culture can create within the genetic architecture itself, seeds which are disease resistant or less affected by herbicides.

A comparison can be made with equivalent occurrences in the development of child welfare. Jacques Donzelot in his *The Policing of Families*[74] shows that when eugenics was being condemned as a nightmare, a series of Keynesian strategies incorporating social work, child psychology and pedagogy provided a frame within which these disciplines sustained control over the family.

In a similar manner Cary Fowler et al.[75] suggest that it is the genetic industry which is now talking the 'genespeak' of organic agriculture and environmental sensitivity. Fowler et al. observe that 'although a billion pounds of toxic active ingredients were poured into American crops, only 1% hit the target'.[76] They continue, 'Previously the American industry used to deny or play down such observations. Today it uses this fact as a part of its new strategy to breed pesticide resistant varieties.'[77] Structured in all such narratives is this act of erasure, a science amnesiacal of its past depredations where herbicide damage alone cost American farmers four billion dollars annually. A comment by Horkheimer and Adorno sums up this attitude. They claim that 'loss of memory is the transcendental condition of science. All objectification is forgetting.'[78] To counter this, Fowler offers a quote from Kundera, 'the struggle of the people against power is the struggle of memory against forgetting'.[79]

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The crisis of diversity has created a strange kind of self reflexivity, fumbling, tentative, and with none of the imperiousness of radical critiques or normal science. It is a search marked by despair, which is sometimes self-inflicted.

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[74] Jacques Donzelot, *The Policing of Families* (London: Hutchinson, 1979).

[75] Cary Fowler, Eva Lachkovics, Pat Mooney and Hope Shand, 'The Laws of Life: Another Development and the New Biotechnologies', *Development Dialogue*, 1988, 1–2.

[76] Ibid., p. 77.

[77] Ibid., p.78.

[78] Quoted in Hwa Yol Jung, *The Question of Rationality and the Basic Grammar of Intercultural Texts* (Tokyo: IUJ Monographs, 1989), p. 39.

[79] Fowler et al., 'The Laws of Life', *Development Dialogue*, p. 72.

Richard Levins, in his *Genetics and Hunger*,[80] elaborates the two interlocking dimensions of the problem. He claims that agriculture poses a problem of two kinds of politics. There is first the common externalist assumption that modern science is a captive of business interests. But scientific knowledge itself is a map of life chances, which can preempt certain kinds of futures. So critiques of knowledge have to operate self-consciously across both internalist and externalist dimensions. To his own rhetorical question, 'if the locus of hunger lies in political economy rather than entomology, why look at genetics?'[81] Levins' answer is that the fact that agriculture is a social and political science does not make it less of a biological science. What he insists on is 'the inseparability of biology and politics within a single science'.[82]

To Levins, an agriculture that serves people's needs requires a base broader than plant biology to allow a more complex view of the world. The most surprising thing about agriculture is that it still feeds people. Agricultural research, he claims, is oriented to the production of marketable commodities like insecticides, fertilizers, machines and hybrid seeds. The feeding of people is incidental to all this, or a mere by-product. 'The linear syllogism that food relieves hunger, crops yield food, improving yields reduces hunger is inadequate.'[83] Such Green Revolution syllogisms are based on too narrow a notion of agriculture, too simplistic a notion of politics. To recover an agricultural view embedded in sustainability and diversity necessitates an alternative imagination poised between realism and utopia.

Such a search for possibilities is limited by a certain sense of professional pragmatism and empiricism. Pragmatism is a belief that only the real is rational and relevant, and that incremental changes can be generated only within the system. Such a pursuit of science ultimately reinforces existing conditions. Supplementing the self-reinforcing effects of pragmatism is empiricism as a professional style. This seeks a professional identity in the specialized and small. Such research similarly reinforces current hegemonies.

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[80] Richard Levins, Genetics and Hunger, *Genetics,* 1974, *78*, pp. 67–76.

[81] Ibid., p. 67.

[82] Ibid., p. 68.

[83] Ibid., p. 67.

What Levins looks for is a halfway house that opens doors to an alternative imagination. He suggests three simple projects:

1. Agricultural systems based on integrated pest control.
2. Application of variability of micro climates.
3. Breeding plants for mixed cropping.[84]

Each of these modest research programmes challenges the real-is-rational approach of agri-business, refusing to accept that the boundary concepts of research are those of the prevailing models of agricultural production and land use.

What Levins suggests is a series of research programmes which simultaneously emphasize the cognitive and ethical. One needs to dream beyond the hegemony of the system and incorporate the sensibility of the Other into research programmes. He makes an eloquent case for this. The feedback loops of science traverse deep into politics and a scientist can no longer claim innocence about the various implications of his work. Levins considers the importance of multicropping in this context.

Disease, today, is not only a logical consequence of monoculture but also a weapon of conquest. The necessity of multicropping becomes a cognitive and ethical imperative because an accepted part of state policy while asserting control is the destruction of crops. The Portuguese used it to control their empire. Levins adds that 'at least one American scientist has won a medal for improving rice blast and at least one pilot run of insect pests have been used against rice crops in the Quan Ngai province in Vietnam'.[85] Given this, it is irresponsible for any scientist to *recommend* the planting of single varieties.

Present in Levins' essay is what one can call a search for a plural framework for science, where the local and concrete can be celebrated as such. Some suggestions he makes in this context require further elaboration.

There is first the question of how scientific specialization can become more sensitive to diversity. This involves in turn a search

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[84] Ibid., p. 70.

[85] Ibid., p. 73.

for a site which allows science to be more open to diversity. He also emphasizes the need for liberating tropical agriculture from the ethnocentrism of current practices.

We began with the question of the classifications of knowledge itself. Beyond the vertical classifications of scientific knowledge into archaeology, anthropology, physics, chemistry, biology are the specializations within biology itself. Here the notion of levels of organization reigns supreme. The levels range from the molecules, cells, organelles, organs, to organ systems, populations and communities, to the ecosystem itself. The vocabularies and techniques of practitioners at each level lead to mutual incomprehension. While each biologist attempts to give centrality to his level, a pecking order has emerged where it is the reductive that is legitimated as powerful, because it claims wider applicability. As a result notions of diversity and variety get restricted to the higher levels of biology.

Implicit in the reductionist zeal—of which monoculture is but one consequence—is a belief in generality, in a science which conceives of order merely as central tendencies, where variance is viewed with despair. George Bartholomew suggests that the time for such adolescent scientism is over. Biology is mature enough to accept diversity as a basic fact of evolution even if it is not amenable to the generalizing impetus of science.[86]

Edward Wilson pushes Bartholomew's ideas further but approaches the necessity of understanding the concrete in a different way.[87] He argues that the difficulty lies in the formulation of the problem itself, basically in internalizing the themata of the levels of organization in biology. What he suggests are disciplines cutting across levels, where one studies an organism or organelle right across the levels from molecules to ecosystems. The division of labour changes from a stress on levels of biological organization to an emphasis on taxonomic groups or organisms. This valorizes the old-style field biologist, the herpetologist, the nematologist, who regain ground lost to the ecologist and the geneticist. The word 'fundamental' in this context could then be applied not just to work which leads to broad generalization, but to studies of individual taxa, even if the information is not readily applicable to other taxa.[88] 'This 45% reorientation', as Wilson calls it, reflects a move away from the search for generality in modern biology.[89]

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[86] George Bartholomew, 'The Role of Natural History in Contemporary Biology', *Bioscience*, 1968, *36(5)*, pp. 324–9; p. 328.

[87] Edward Wilson, 'The Conceptualization of Biology and the Stewardship of Systematics', *Bioscience*, 1989, 39(4), pp. 242–5.

Wilson is frank enough to contend that this reorientation stems from two reasons, one pragmatic and the other cognitive. Biology, of late, has produced few general principles which can be applied widely, fruitfully or interestingly. Secondly, there is the recognition that 'the laws of biology are written in the laws of diversity'.[90] This suggests that a plurality of biological approaches are required for understanding the variety of species and organisms. 'When you have seen one species of chrysomelid beetle, you have not emphatically seen them all.'[91] There is more than the first glimmer of the celebration and understanding of the object for itself.

Yet in celebrating diversity, Wilson still operates within the permissible spaces of dissent in science. He still accepts the divide between science and the humanities which might emphasize magic, religion or myth. Consider the snake or the coconut. In *Biophilia* Wilson has a succinct article on the myths of the snake across cultures.[92] But while celebrating the mythology, he also reduces myths about the fear of snakes to an expression of a primordial biological instinct. For Wilson such myths could add to the aesthetics of the snake, even to poetry, but they would not be relevant to science. In his search for the concrete and the variable, Wilson would study the snake or hopefully the coconut across levels of biological organization but he would not integrate the political, religious or mythological understanding of them within scientific knowledge. It is the old dilemma of parts and wholes. It needs the recognition of three kinds of wisdom: firstly, the ecological wisdom of the whole being greater than the sum of the parts; secondly, the

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[88] Ibid., p. 243.
[89] Ibid., p. 244.
[90] Ibid., p. 244.
[91] Ibid., p. 245.
[92] Wilson, *Biophilia*, p. 83-101.

biological wisdom that parts have to be celebrated as parts and not reduced to impoverished wholes. There is also a synecdochic understanding where every part represents the whole. Here, as resonators of a more mystical notion of the whole, the coconut is simultaneously myth, food, music, economics and art. It is not the holisms of systems and cybernetic views but of a cosmology that simultaneously speaks secular, religious and magical languages.

The second approach for a constructive understanding of diversity is in the work of Eugene Odum.[93] The importance of diversity in agriculture needs a site away from the laboratory where the wisdom of nature can be understood without succumbing to reductionist genetics. One needs a notion somewhere between natural systems and molecules which is also open to both. This is necessary, for the history of science has swung undialectically between holism and reductionism. Such a dialogical and dialectical site is the 'mecocosm'. Though mecocosm sounds occult, Odum who sticks to systems terminology would not call it a dialogic site. For him it is a world of feedback loops, halfway between laboratory microcosms and large, complex, real world macrocosms. The answer he suggests—and it is one also argued by Stanton Hicks and Levins—is the field, provided 'fields themselves are treated as part of the biological cycle'.[94]

At one level, banal, even prosaic, a field is a profound entity. Cultivated fields are ideal mecocosms. They raise issues of genetics which are ignored when the field is generally reduced to a starch factory. The field is a system where all the parts are evolving, where pests are adapting to control techniques like insecticides. The field, unlike the laboratory with its one-step model of causation, is far more complex in its interactions. Instead of a reductionism that pits crops against herbicide, the field as a mecocosm consists of 'predator-parasites, nitrogen-fixing bacteria, mites and collembola carrying out preliminary decomposition of residues, the earthworm and nematodes, all as active participants of a system. Their indirect effects on crops may be as great as the less remote one-step causation models of the laboratory.'[95] The field as an open system is sensitive to issues like multiple cropping. As Levins observes, one understands the wisdom of how 'even a modest increase in the distance between the fields of a given crop might exclude a pest species completely'.[96] Or how 'the migratory rate of a pest may be reduced by interplanting other plants whose odours can confound the sensory apparatus of a pest'.[97] Levins adds that cultivated fields are ideally suited not only for understanding biogeographic principles but also the issue of seasonality in a way that current models of genetic change and population fluctuation cannot handle.

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[93] Eugene Odum, 'The Mecocosm', *Bioscience*, 1984, *34(9)*, pp. 558-63.
[94] Hicks, *Man and Natural Resources*, p. 120.

The third major approach to diversity within science concentrates on a recovery of the tropics for science. Both Levins and Daniel Janzen[98] have insisted that the transfer of temperate sciences to the tropics is unethical. They note that North American models of high energy, high fertilizer monoculture are not only destroying the tropics ecologically but disrupting them as sites for alternative imaginations. The notion of the tropics raises once again the need for a pluralized approach both to diversity in nature and to the diversity of agricultural practices.

The tropics, by definition, allow many different solutions to resource use, each of which may be as profitable as the other. Given this diversity of tropical systems, the conventional scientific approach of creating 'a generalized eco-system model upon which to base resource use decision' is highly impractical. Its structure would necessarily be based on statements of central tendency as would its predictions. But the needs of the tropical man frequently deviate from generalized ecosystem models. What one requires is again a move away from generality towards sustainable yield solutions for each region. Such a regional approach, understanding complexities of local interactions, seeking optimum models for each region or even locality, would change the trend of the reductionism of present day tropical agriculture which focuses predominantly on one variable yield improvement. Janzen admits that when each tropical system is treated as unique, charges of parochialism can be made. Responding to this requires both a cognitive and an ethical imagination. He suggests that the scientist must decide whether a tropical station is to help a self-contained agro-ecosystem, or whether it should produce work like the International Research Institutes which integrate the agrosystem into the world economy. He laments that there is no moral code preventing methods of injecting temperate zone science and technology into the tropics. These methods include the Peace Corps, military bases, tractors, miracle seeds, grain surpluses, hydroelectric dams. Each aid or transfer prevents the possibility of a real alternative developing in the tropics.[99]

In this part of the essay we move from a reflection of knowledge to a consideration of nature in science, which has become captive to economics. This problem becomes obvious as scientists try to create a theoretical rationale for sustaining diversity in nature.

It involves two separate kinds of arguments. The first demands that one faces up to the fact that nature does perform an economic function through activities like soil binding, absorbing radiation and so on. The ecologist is aware of it in a generalized form and Walter Westman's 'How much are Nature's Services Worth?'[100] is a good demonstration that nature's services are too complex to fit the monetary matrix of cost–benefit analysis (CBA).

The problem becomes more specific when it comes to evaluating the loss of a particular object. Implicit in this is a set of questionable axioms reflecting what might be called the great chain of being argument, where man, generally modern western man, is seen as the crown of creation, all nature being created for his use. Nature as forest, sea, or soil turns into a mine to be exploited and abandoned. Implicit in this is also the notion of obsolescence, of valueless objects that can be abandoned or forgotten. One is not confronted merely with the ethnocentrism of western Judeo-Christian

[95] Levins, 'Genetics and Hunger', *Genetics*, p. 74.

[96] Ibid., p. 75.

[97] Ibid., p. 75.

[98] Daniel Janzen, 'Tropical Agro-Systems', *Science*, 1973, 182, pp. 1212–19.

[99] Ibid., p. 1217.

[100] Walter Westman, 'How Much Are Nature's Services Worth?', *Science*, 1977, *197*, pp. 960–4.

cosmology but also with cultural codes within it. How does one guarantee the objectivity of particular preferences, what does one save? Ecologists have shown that protecting one 'specimen' virtually writes the death-warrant of the other by default. Robert Leo Smith remarks that arguments for preserving a living organism can be based on the fact that it is a luxury, a necessity or an asset. 'By such criteria,' he adds, 'society can be rallied to save the bald eagle, for example, or come to the rescue of whales or seals. But it is extremely difficult to rally public support to save the blunt-nosed leopard lizard. The eagle has merit in the public mind, the lizard has none.'[101] This is not just true of particular animals or plants; it can extend to the selection of habitats. 'Habitats rich in birds and mammals are more likely to be saved than those that are rich in insects and plants. The legitimate concern of avoiding extinction of species leads automatically to less concern over the ecologically spectacular but species-poor habitats like dry forest, swamps, high elevations, poor soils.'[102] The logic of conservation based on utility can produce strange ironies, especially when men assume that they can evaluate the full value of a species, including its future utility. Ecology shows nature to be complex enough to make such evaluations ironically facile.

One of the saddest stories in this context relates to the *Raphus calcullatus,* the dodo. This much maligned bird, a native of Mauritius, became extinct in 1681 less than two centuries after it was 'discovered'. The posthumous apology to the dodo begins almost three centuries later with the discovery that there were only thirteen trees of the *Calvaria major* left. Each of these trees was over three hundred years old. The trees did produce well-formed seeds, yet the total absence of young plants puzzled botanists. Even when planted under nursery conditions, the seeds remained dormant.

Stanley Temple, a University of Wisconsin biologist, felt that there was some correlation between the disappearance of the dodo

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[101] Robert Leo Smith, 'Ecological Genesis of Endangered Species: The Philosophy of Preservation', *Annual Review of Ecology and Systematics,* 1986, *7,* pp. 33–5.

[102] Daniel Janzen, 'The Future of Tropical Ecology', *Annual Review of Ecology and Systematics,* 1986, *17,* pp. 305–24.

and the slow extinction of the tree. He discovered that while the seed of the Calvaria had a thin exocarp and a fleshy mesocarp, it had a hard thick-walled endocarp. The dodo ate these seeds, which it probably retained in its digestive tract, and it was here that the process of seed germination was accelerated through the abrasion of the seed coat. Temple forcefed the seeds to turkeys and successfully germinated the first Calvaria in three centuries, too late however, to save the dodo.

The choice of what to save still operates in terms of some notion of the chain of being. In its modified versions it still holds that creatures are made for man's use but man is regarded as a trustee, responsible for the stewardship of the earth. What is missing, however, is not the criteria of selection but some wide cosmological notion of kinship which sees the earth itself as alive. Unfortunately, the establishment of science had led to the abandonment of the *anima mundi* idea which saw the whole earth as alive. The mechanical worldview has turned nature into a toolshed. Within the toolshed view, the general argument for saving species takes on either an aesthetic or utilitarian dimension. The two can overlap as when nature is seen as having a recreational value, which will attract tourists, and tourism is then assigned an economic function, which is quantifiable.

The problem of looking at economic value is threefold. First, talking in terms of economics is itself a metaphysical trap that scientists get embroiled in. The language of economics may fail to provide the life-giving assumptions required for ecology. Even if we accept an 'economistic attitude to nature', other problems arise.[103] The first can be dubbed the non-resource problem and the second, the substitutability assumption.

Aldo Leopold in his 'Land Ethic' provides the classic formulation. 'One basic weakness of the conservation system wholly based on economic motives is that most members of the land community have no economic value. When one of these economic categories is threatened and if we happen to love it we invent subterfuges to give it economic importance.'[104]

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[103] See D. Ehrenfeld, 'Thirty Million Cheers for Diversity', *New Scientist,* 1986, *1512,* pp. 38–43.

[104] Leopold, *A Sand Country Almanac,* p. 246.

Also, as Ehrenfeld and others have noted, economism forces science to speak not the ordinary language of conservation ethic but the formal equations of cost–benefit analysis. It assumes that money can evaluate all aspects of nature, past and future, and that its benefits for every section can be graded. Such a framework has also trapped science in the substitutability problem.

For example, when an economist like Simon advocates the destruction of Amazonian forests by claiming that the forests are not really being degraded because they are being replaced by valuable plantations of pine or eucalyptus, the ecologist gets involved in scholastic exercises about the economic functions of nature, attributing anthropomorphic values to soil binding, hydrological functions and so on.[105] But by doing this he slips back into the mining model of nature. Such economistic functions of substitutability, first applied to minerals, are now being applied to tropical forests.

What Ehrenfeld is suggesting is that the language of economism is not really the language of nature. In fact a philosophy of a money economy only resonates with the philosophy of a western science which has been hostile to nature. Both combine to dissolve the very ecologies they are trying to defend.

If nature cannot be saved at the level of production, conservationists seek to protect it at the level of consumption by giving it a pedagogic, recreational or aesthetic value. The notion of aesthetics tries to treat a part of nature as a cultural artifact. Rarity is not viewed biologically as something restricted but as something equivalent to a painting or a stamp. Endangered species are viewed as analogous to works of art. The economic substrate produces ironies because once a species is declared rare it becomes even more vulnerable, subject to the attack of collectors and poachers. Secondly, just as art is not seen as a part of living tradition but as an alienated object in a museum, the species is not seen as part of a living process or live agricultural tradition. It is cut off, and embalmed in time in a reserve or a museum. Aesthetics, like science, still smells of formaldehyde.

The irony of attributing economic values is that the very act of attributing value on the basis of scientific research leads to eventual

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[105] Ehrenfeld, 'Thirty Million Cheers', *New Scientist*, p. 38.

extinction. When a Norman Meyers or an Edward Ayensu lists the huge cornucopia of what a tropical forest can provide, they are eventually inviting the exploitation of the forests; not its preservation. 'A tropical rain forest being tapped for its exotic fuels, chemical precursors, rubber, unusual hardwoods and drugs and filled to the brim with researchers, agronomists, organic chemists, ethnobotanists, ethnologists and photographers is not likely to keep its diversity much longer than one that is napalmed or burnt to produce transient pasture for fast food hamburgers-on-the-hoof.'[106] One has to merely think of the destruction of the ***Rauwolfia serpentina***. Once common in the forests of India, it was hailed as the source of reserpine, effective for hypertension. The plant has been hunted so systematically that it has the dubious honour of being on the endangered list.

Ehrenfeld shows that the rationale for diversity cannot be built on a science arguing for the economic, pedagogic, or aesthetic criteria for nature. The problem also lies in the language and perspective from which this is articulated.[107] He argues that today 'generality is the theme and power of the technological era, the key to our ability to manipulate the environment.'[108] Generality reeks of the reductionist and the universalizable. Ehrenfeld adds that 'in biology, diversity held its own until the rise of reductionist molecular biology. From then on diversity makes its descent into the second rate and the second class.'[109]

The taxonomist whose task it was to link the general and the concrete is today a neglected scientist and an object of fun. In fact, *Taxon* recently published a story of the disappearance of the last taxonomist. Following Philip Wylie's bestseller, it was entitled *The Disappearance*. What characterized taxonomy was the search for order in the celebration of diversity, embodied in the work of Linneaus himself, which was marked by a celebration of detail and its language. Yet today this preoccupation with the local and the detailed is frowned upon, even condemned. Scientists repeatedly refer to James Watson's attack on the taxonomic old guard of Harvard and their vested interest in mosses.

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[106] Ibid., p. 42.

[107] Ibid., p. 43.

[108] Ibid., p. 43.

[109] D. Ehrenfeld, *The Arrogance of Humanism* (New York: Oxford University Press, 1978), p. 178.

Ehrenfeld eventually contends that the theoretical rationale for diversity cannot be derived from science. His comment is very similar to that of the great soil chemist, Hans Jeny, who claimed that chemistry talking of colloids cannot provide the basis of a soil ecology. Jeny was one of the first advocates of the rights of different kinds of soil to exist and he carried slides of soil samples to demonstrate that they could aesthetically be as beautiful as the work of the Impressionists.

Like Jeny, Ehrenfeld feels that the language of molecular biology is semantically inadequate and that the search for such a framework has to be sought outside science in the realms of religion, poetry or local knowledges which can provide at least thirty different words for soil.[110]

There is a despair in Ehrenfeld's writing. He exclaims that the humanist world 'accepts the conservation of nature only piecemeal and at a price'. He admits science has no way of saying as Goethe did of nature that 'each of her creations has its own being, each represents a special concept, yet together they are one'.[111] Ehrenfeld believes that one has to wait for a new phase of science. In the meantime it is only groups outside science, activists involved in politics, religion and in local bodies, who can recapture the love of diversity for its own sake.

The tensions of evaluating nature economically is caught in the literature of parks and reserves. I do not propose to examine the conventional critiques made of reserves. What I wish to do is to examine parks and reserves as collective representations.

The park as embodied in ideological landscaping epitomizes the industrial idea of arcadia.[112] Its morphology has to be understood in relation to the urban industrial system. The park and the factory town represent complementary parts of the same process. They seem overtly opposed to each other because while the factory is organized for production, the park is organized for consumption. In the primary grid of production, the relation to nature is openly exploitative, in the secondary grid, the facts of production are forgotten and nature becomes an aesthetic delight to be consumed at leisure. It is the economics of aesthetics that capture the two basic roles of the park today. There is first the relation of production to consumption and, second, of production to preservation. Here nature is preserved not only to be consumed by tourists but as a reserve for later industrial use. Preservation thus combines both the function of maintenance for later production and consumption through leisure and recreation.

The movement of the park to what is now called biosphere reserve captures this both at the classificatory and morphological level. Laura Tangley claims that a biosphere reserve is a more ambitious concept than a park.[113] While parks focus on aesthetics and recreation, reserves claim additional functions. Basing herself on Michael Batise's work, Tangley shows that a biosphere reserve can be visualized as three circles performing three different functions.

The first is an attempt to preserve a minimally disturbed ecosystem large enough to ensure genetic and species diversity. Second, the reserve plays a logistical role providing for a whole range of education, training and research activities. These include environmentally non-manipulative activities like measurement of acid rain precipitation.

But the reserve moves beyond the park in also having a developmental role. Beyond the core and buffer zones, is a transitional zone where the reserve reacts with the neighbourhood areas, attempting to work out new models of sustainable development. Thus unlike parks which exclude humans except as tourists or officials, reserves try to involve local people as contributors of reserve activities. Outstanding examples of such reserves include the 52,800 hectare Sean Ka'an reserve in Mexico and the great reserves of Costa Rica. Here, under the guidance of Daniel Janzen the entire reserve is being turned into a classroom which can create in Costa Rica a generation of environmentally sensitive scientists.

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[110] See Kevin Stuart, 'My Friend, the Soil: A Conversation with Hans Jeny', *Journal of Soil and Water Conservation*, 1984, *39(3)*, pp. 158–61.

[111] Quoted in Ehrenfeld, *The Arrogance of Humanism*, p. 177.

[112] See Raymond Williams, *The Country and the City* (London: Chatto and Windus, 1973).

[113] Laura Tangley, 'A New Era in Biosphere Reserves', *Bioscience*, 1988, *38(3)*, pp. 148–55.

Yet the reserve is not only a site of consumption, it is being preserved for production, and it is here that a certain uneasiness enters. Something about it reminds one of a future mine, something waiting to be plugged into the industrial system, so much gene plasm awaiting the giants of the pharmaceutical industry.

There is a strange dualism, a tension present. While a tropical ecologist talks of the density of the tropical forest and its diversity, the geneticist might want to rip off a plant for his latest LEGO set. The scientist himself suggests that the celebration of technological progress and the sense of loss is part of the same mind set. Daniel Janzen has also hinted that the 'replacement of fresh oranges by pasteurized orange juice in paper containers and the adoption of the national park concept'[114] might be part of the same development frame.

There seem to be two notions of the reserve which can be best understood in terms of an example Heidegger once gave. He compared an old bridge across the Rhine and a modern power plant. While the bridge leaves nature alone, the hydroelectric plant, Heidegger observes, incorporates the Rhine river into itself 'so that the river becomes merely a part of the machinery needed to generate electricity. The riverly character is denied as it becomes a mere resource used to turn generators.'[115] Similarly, many a reserve, or even more the much touted gene banks, become the equivalent of the hydroelectric plant, technologically identified with industry.

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[114] Janzen, 'The Future of Tropical Ecology', *Annual Review of Ecology and Systematics*, pp. 320–1.

[115] Alderman, 'Heidegger's Critique of Science and Technology', in Murray, *Heidegger and Modern Philosophy,* p. 48.

VI

There are several issues that this paper has not touched upon, not because they are not important, but because the professional scientist fails to develop them. There are three aspects which are more the work of people's science movements than anything else. There is first the need to develop a sense of juridical domain within which science works. What happens when life forms themselves get patented? Professionalized science has no equivalents for the work of Jeremy Rifkin[116] or Carry Fowler[117] and Pat Mooney. The latter two have explored in detail how the concept of patenting seeds and other life forms has altered science juridically. Mooney and Fowler still operate within the domain of the contract, but hint that what one needs is the language of the commons where past and present constitute parts of one community. The idea of commons defines access in terms radically different from contract. Rifkin adds to it an ethical imperative that scientists cannot understand, a plea to renounce the pursuit of genetic engineering.

There is a third dimension that peoples' groups emphasize. They contend that ecology is the privileging of civil society against the state, challenging the contract between nation-state and modern science. People's movements need local knowledges, and a fervour which professionalized science cannot provide. Ecology is dialogic and for such dialogics, western science has to converse with traditional knowledge. A recovery of the agricultural worldview in science presupposes an encounter with the diversity of traditions, techniques and knowledges that constitute agriculture. Dissenting science needs to enter these spaces. If not, there might come a time when peasant society confronted with modern science might have a new vision of the four horsemen of apocalypse as four scientists: Karl Marx, Charles Darwin, Albert Einstein and the meek figure of the Czech monk, Gregor Mendel–carrying in their wake plague, death, desolation and destruction.

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[116] Jeremy Rifkin, *Algeny* (Harmondsworth: Penguin Books, 1984).

[117] See Fowler et al., 'The Laws of Life', *Development Dialogue,* 1988. Mooney, 'The Law of the Seed', *Development Dialogue,* 1983.

Modern Medicine and its Non-Modern Critics: A Study in Discourse[1]

I

Development, Medicine and Language

The idea of development has served many purposes in our times. It has served as a reason of state, as a legitimizer of regimes, as a component of visions of a good society and, above all, as a shorthand term for the needs of the poor and the needy. It has produced a new expertise and created a new community of development scholars, policy-makers, development journalists, readers of development news, development managers and activists—who together can be said to constitute the development community.[2]

There is one purpose, however, that development has served rather less conspicuously: it has endorsed the claims to power over the human body, as a domain of social knowledge and social intervention, ventured by organized centres of power in a society. These are centres inaccessible to the citizen and often even to the community to which he belongs. Taken away from the individual and handed over to the organized centres of power in the society, the body politically becomes and is redefined as either a carrier of hedonistic pleasures or a vehicle of diseases and suffering.

If the body can be separated from a person's selfhood and controlled, it can also be corrected and improved. Also, the body can be controlled only if it can be corrected and improved. Either way, another area of supposedly individual choice becomes a part of public life, directly subject to the society's power-knowledge nexus and to the typical format of expertise which goes with the nexus. What was once a matter of personal suffering and personalized healing becomes thus subject to the demands of large-scale engineering, planning and intervention. Medicine becomes a proper theme in development.

Development in its halcyon days was related to economic development. Other disciplines entered the area apologetically or stealthily—as the supplementary knowledge of social structures and insights into the psychological factors facilitating or hindering economic growth, as information about the political factors influencing economic decisions. As the idea of development has expanded, development has become a larger area: not merely is there now a science of development but also a development of science; not merely the technology of development but also the development of technology.

As a consequence of such reversals in speech, development is no longer the mere treatment of the economic ills of a society; the development of healing as a science has become an important plank in the ideology of development. Development is no longer development unless it takes the benefits of modern medicine to the traditional, underdeveloped parts of the society, unless diseases and pestilences are removed by modern knowledge from the lives of the citizens, and unless the entire population of a country is brought within the ambit of modern medicine and taken out of the dominion of folk wisdom, domestic remedies and non-modern healers.

Such a development was probably inescapable. For the last time since the social sciences came into their own after World War II, the language of modern medicine has contributed handsomely to the language of development. Pathology, sickness, treatment, diagnosis, and cure have all been important terms in that part of the language of the body politic which has constituted the main discourse on development. Thus the now-recessive enthusiasm for the psychological sources of economic growth has often used the language of *injecting* the entrepreneurial spirit in underdeveloped cultures and of *curing* the pathology of non-entrepreneurial persons by introducing the *virus* of the achievement motive into them under quasi-therapeutic conditions.[3] The non-enterprising person has been seen, regularly enough, as falling short of full psychological health and negating the organizing principles of the fully functioning personality, at least in the popular culture of development studies.[4] Development is good, the argument goes, because it brings true health to everyone; development is health because healthiness takes you towards or gives you development; and finally, development is healthy because the language of development extends the modern language of healing not only to the individual but also to the society.

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[1] Written in collaboration with Ashis Nandy.

[2] Readers will of course notice the similarity between Henry Kissinger's concept of the foreign policy community and our concept of the development community. This is not accidental. Both communities perform roughly analogous functions.

Well before Michel Foucault and Ivan Illich became eponymous figures in contemporary social criticisms of modern medicine, traditional systems of thought and ways of life displayed a certain scepticism not only towards foreign or non-rooted systems of healing, including what is called modern medicine or allopathy, but also towards traditional systems, including the ones to which these sceptics gave their allegiance. It was this element of 'self-criticism' which gave the traditional systems of medicine part of their resilience and humanness.

It is possible to argue that modern medicine, one of the last sciences to grow out of traditional sciences in Europe and consolidate itself as a 'proper' science in the nineteenth century, was the

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[3] See, for instance, the description of the group-therapy-like situations in which the achievement motive was sought to be introduced in third-world societies in David C. McClelland and David G. Winter, *Motivating Economic Achievement* (New York: Free Press, 1969).

[4] If one offsets against this Everett Hagen's description of the non-enterprising person as the authoritarian person *a la* Theodor Adorno and his associates, one is left with little doubt that the problem of development was sought to be medicalized by some. E. Hagen, *On the Theory of Social Change* (Homewood, Ill.: Dorsey, 1963).

first major system of healing to try to do away with this element of scepticism and self-criticism. Some of the scepticism and criticism survived in the popular culture, but did not translate into philosophical doubt within the system. The Popperian principle of falsifiability, so central to the positivist self-concept of science, does not include within its scope any scepticism about the culture or the basic philosophical assumptions of post-seventeenth-century science. Once medicine became a positivist science, its institutionalized concept of self-criticism got redefined. The self-doubt of the modern doctor is essentially a personal self-doubt; so is the doubt of the patient expressed through medical litigation, or in the relationship the patient enters with the doctor. The doubt almost always centres on the doctor's skills or around empirical medical knowledge, rarely around the philosophical and cultural assumptions of modern medicine.

In fact, it is possible to argue that the principle of falsifiability itself has suppressed many forms of critical consciousness within modern medicine. Certainly the principle has not allowed the kind of folk wisdom which many traditional systems of healing have often used as a baseline of criticism (expressed for instance in the often-quoted quasi-Sanskritic saying in many parts of India, of which a free translation is 'one who kills a hundred becomes an ordinary doctor, one who kills a thousand becomes a great physician') or the kind of folk wisdom which holds medicine rather than the doctor in awe.[5] Clifford Geertz has talked of common sense as a cultural system.[6] By disconnecting itself from community life which organizes common sense as a culture, modern medicine has disconnected itself from the common sense which endorses scepticism in many traditional cultures of medicine.

In this essay we review the implicit visions of health and knowledge which scaffold modern medicine in South Asia, and in the process provide an outline of the worldview and concerns of some of the more explicit criticisms of modern medicine produced in the region. We provide this stocktaking with the awareness that the intellectual debate on modern medicine in South Asia is organized around two philosophical positions.[7] For the first, a critique of modern medicine has to be primarily contextual; for the second, it has to be both contextual *and* textual.[8] We locate our analysis in the space defined by these two groups and try to expand the scope of the debate by reconstructing some of the debates on the subject which took place earlier in this century.

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[5] See discussion of this scepticism in Sudhir Kakar, 'Doctor at Large', *The Illustrated Weekly of India,* 6 July 1986, pp. 18–21.

[6] Clifford Geertz, 'Commonsense as a Cultural System', *Local Knowledge: Further Essays in Interpretive Anthropology* (New York: Basic, 1983), pp. 73–93.

We are aware of the excellent work done on traditional systems of Indian medicine by academics such as Charles Leslie, Paul Brass,

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[7] See, for instance, Kama Jayarao and Ashvin Patel (eds.), *Under the Lens, Health and Medicine* (New Delhi: MFC, 1986); Abhay Bang and Ashvin Patel (eds.), *Health Care, Which Way to Go* (New Delhi: MFC, 1985); C. Sathyamala, Nirmala Sundharam and Nalini Bhanot, *Taking Sides: The Choices Before the Health Worker* (Madras: ANITRA, 1986); Ziauddin Sardar, 'Medicine and Metaphysics: The Struggle for Healthly Life-Styles', *Afkar Inquiry*, October 1986. *3*, pp. 40–7; Madras Group, 'What is the Role of Indigenous Medical Sciences in our Health Care System?', *PPST Bulletin*, June 1984, *4*, pp. 64–95; Claude Alvares, 'Science, Colonialism and Violence', in A. Nandy (ed.), *Science, Hegemony and Violence: A Requiem for Modernity* (Tokyo: United Nations University Press and New Delhi: Oxford University Press, 1988), pp. 68–112; Manu L. Kothari and Lopa Mehta, *The Nature of Cancer* (Bombay: Kothari Medical Publications, 1973); and *Cancer, Myths and Realities* (London: Marion Boyars, 1979); also various issues of *Information*, the newsletter of the Voluntary Health Association of India, and the *PPST Bulletin*.

[8] The former is associated with groups such as Medico Friends Circle, the Delhi Science Forum, Kerala Sashtra Sahitya Parishad, Consumer Education and Research Centre, and some others associated with the Drug Action Network as well as activist-scholars like Abhay Bang, Anil Sadgopal, Narender Mehrotra, Dhruv Mankad and even probably the redoubtable Zafrulla Chaudhuri. On the other side are activist-scholars like Ziauddin Sardar, Claude Alvares, Mira Shiva of the Voluntary Health Association of India and many in the PPST group. Manu Kothari and Lopa Mehta, two of the best-known social critics of medicine in this part of the world take a more eclectic position though they are obviously more in sympathy with the second position philosophically.

Roger Jefferey and Francis Zimmermann. But they bypass intellectual attempts, often from outside academia, to grapple with the social relations and political content of modern medicine in contemporary India. And we, living in a post-Bhopal world, are forced to define our intellectual responsibility mainly in terms of the politics of knowledge with which live the social critics and political activists working in the domain of health in India today.

Manifest Critiques

There are some identifiable foci in the public debate on modern medicine the world over. And both sides in the debate, the external and internal critics, have their own distinctive approaches. The dominant idiom is that of the external critics who stress implementation—the social responsibility of the modern doctor, the inequity in medical delivery systems and the pros and cons of socializing medicine. The internal critics try to bring the *content* of modern medicine under critical scrutiny. Their baseline of criticism is outside modern medicine, often outside the modern worldview.

Thus, internal critics give the example of the major killers in human history—pestilences ranging from plague to cholera—which have been eliminated from many countries not by modern drugs but by improved public health systems. Plague died out in Europe well before its nature was identified and a medical antidote was found for it.

> The study of the evolution of disease patterns provides evidence that during the last century doctors have affected epidemics no more profoundly than did priests during earlier times...
>
> The infections that prevailed at the outset of the industrial age illustrate how medicine came by its reputation. Tuberculosis, for instance, reached a peak over two generations. In New York in 1812, the death rate was estimated to be higher than 700 per 10,000; by 1882, when Koch first isolated and cultured the bacillus, it had already declined to 370 per 10,000. The rate was down to 180 when the first sanatorium was opened in 1910, even though 'consumption' still held second place in the mortality tables. After World War II, but before antibiotics became routine, it had dropped into eleventh place with a rate of 48. Cholera, dysentery, and typhoid similarly peaked and dwindled outside the physicians's control...nearly 90 per cent of the total decline in mortality between 1860 and 1965 had

occurred before the introduction of antibiotics and widespread immunization.[9]

Even if one does not fully accept such arguments, it is possible to see the major elements in the present crisis in medicine as the points of convergence of both contextual and textual—external and internal—problems. As the 'hard realities' of this crisis are not our concern here—this is a study in discourse, not an empirical stock-taking of modern medicine—we shall enumerate the problems only to set the stage for our analysis.

The first is the much-discussed problem of clinical iatrogenesis. There are now societies where nearly one-third of all medical referrals are reportedly iatrogenic. In specific areas the data could look even more disturbing. For instance, in Massachusetts, the number of children disabled by the treatment of cardiac non-disease exceeds the number of children under effective treatment for cardiac disease.[10] The situation attains a certain poignancy in many African and Asian societies where entire populations are often herded like cattle, through coercive legislation or with the help of massive propaganda by state-owned media, towards accepting medical or surgical interventions or drugs which are unacceptable to many rich societies. Millions of plastic loops distributed for contraception without proper medical supervision, heavy use of useless but harmful choloroquinol-based anti-diarrhoeal agents, indiscriminate prescription of concentrated vitamin preparations (which have dramatically improved the health of ants and earthworms in many societies because they are excreted by the human body within a few hours), useless surgery ranging from unnecessary tonsilectomy and removal of impacted molars to cardiac bypass and Caesarean section, over-intervention in cases of cancer—they can all lead to forms of suffering against which there is usually little check—medical, social or legal—in third world societies.

Second, there are the mutant organisms or the drug-resistant strains of bacteria which have 'learnt' to live with drugs. As the drugs multiply, so do the strains of common organisms. These new strains are often more virulent and less manageable than the original organisms with which humans have learnt to live for thousands of years. Typhoid vaccination, according to some, is now effective in less than 50 per cent cases; the Widal test, till recently a reasonable laboratory 'proof' of typhoid, is effective in fewer and fewer cases. Meanwhile, typhoid has become more difficult to identify through clinical observation, for the contours of the disease have changed in many countries, and chloramphenicol, the antibiotic routinely used in typhoid, now refuses to give results in a large proportion of typhoid patients, due to its heavy and indiscriminate use over the last three decades for even minor ailments.

Third, there is the growing cost of treatment. Medical research now costs more not merely because of inflationary pressures, but also because of the growing demands on the medical R&D systems to produce drugs to cope with iatrogenic complications and mutant organisms. The average American now spends more on his health bill every year than on food or shelter. This cost becomes prohibitive for the poorer parts of the world which are often unable to keep up with modern medical R&D but have to bear a major share of the burden by paying high prices for drugs and new medical technology. Not only have the new drugs begun to reflect galloping R&D costs, but just when some third world societies acquire the technology for a wonder drug and can bring down its price through mass

[9] Ivan Illich, *Medical Nemesis: The Expropriation of Health* (New York: Pantheon, 1976), pp. 15–6; also '12 Years After, Ivan Illich Revisits Medical Nemesis', *IFDA Dossier*, July–August 1988, (54), pp. 3–8. The only apparent exception to the rule has been smallpox. This exception can be viewed in two ways. First, one may argue that the 'irrational' resistance to smallpox vaccination in many societies is partly a result of a 'rational' generalization made by the public from their experience of other epidemics. Whereas the use of the example of smallpox by the elites and the westernized middle classes of the third world, to illustrate irrational resistance to modern health care, can be seen as an interested attempt to generalize from a single exception. Second, it is also doubtful if the theory of smallpox-as-an-exception can be fully sustained, for traditional methods for combating the disease were effective but were politically eliminated, often through the use of coercion. See Frederique Apffel-Marglin, 'Smallpox in Two Systems of Knowledge', in Frederique Apffel-Marglin and Stephen Marglin (eds.), *Dominating Knowledge: Development, Culture and Resistance* (Oxford: Clarendon Press, 1990), pp. 102–44.

[10] Illich, *Medical Nemesis*, p. 24.

production, the effectiveness of the drug begins to decline. Thus by the time penicillin was made cheap and easily accessible to Indians, its effectivity had declined from 92 per cent in the 1950s to 8 per cent in the early 1980s, and doctors were forced to resort to costlier and more effective alternatives.

Fourth, there are now health problems created and sustained by the urban-industrial lifestyle. Modern medicine finds it difficult to cope with environmentally-induced health disasters because it operates on the basis of Baconian inductionism, somewhat in the fashion of the detective in a Victorian crime thriller pursuing a single criminal who seemingly has nothing to do with the rest of the society and whose elimination leaves the society healthy and whole. One example will suffice:

> Some years ago, large quantities of DDT were used by the World Health Organisation in a programme of mosquito control in Borneo. Soon the local people, spared a mosquito plague, began to suffer a plague of caterpillars, which devoured the thatched roofs of their houses, causing them to fall in. The habits of the caterpillars limited their exposure to DDT, but predatory wasps that had formerly controlled the caterpillars were devastated.
>
> Further spraying was done indoors to get rid of houseflies. The local gecko lizards which previously had controlled the flies, continued to gobble their corpses—now full of DDT. As a result, the geckos were poisoned, and the dying geckos were caught and eaten by house cats. The cats received massive doses of DDT, which had been concentrated as it passed from fly to gecko to cat and the cats died. This led to another plague, now of rats.
>
> They not only devoured the people's food but also threatened them with yet another plague—this time the genuine article, bubonic plague. The government of Borneo became so concerned that cats were parachuted into the area in an attempt to restore the balance.[11]

Finally, giving these four elements of the crisis a sharp edge is what Mira Shiva infelicitously calls the pharmaceuticalization of health.[12] In societies where modern medical technology is available only in a few pockets, where the number of modern doctors and hospital beds are few, and where the capacity to pay for modern medical facilities is poor, medicalization has built-in limits. But the penetration of drugs into all spheres of life, including medicine, becomes for the same reasons deeper and more dangerous. Often one finds in such societies that drugs with their easy and wide reach are expected to take over the responsibility for public health from the doctor and health care agencies, in fact from society itself. And the drugs, in the context of these expectations, become an end in themselves. According to at least one estimate, the proportion of useless drugs in India is as high as 70 per cent and there are 4000 drugs in circulation in the country which are banned or could be banned in other countries.[13]

These five crises of modern medicine can be studied in many ways—as problems of medical R&D, as problems of medical training and hospital management, and even as indicators of a paradigmatic crisis in modern medicine. Here we seek to grapple with the crises at the plane on which the dominant philosophy of healing constructs the patient as a scientific reality and defines the doctor and his therapeutics as a scientific enterprise.

Latent Critique

Underlying the manifest crises of modern medicine are two basic and related issues: first, reconstruction of the reality of the patient through standardization of the two-person relationship within which a therapeutic encounter takes place, including the specific forms the principles of experimentation and operationalization assume within modern medicine; and secondly, the reconstruction of the doctor as a specialist or professional and the redefinition of the doctor as an applied scientist rather than a healer. Those providing a critique of modern medicine with an awareness of these latent issues assume that the core of medical practice is not the cumulating knowledge of physiology and drugs but the dyadic interpersonal relationship between doctor and patient.

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[11] Anne Ehrlich and Paul Ehrlich, *Extinction* (London: Victor Gollancz, 1982), quoted in Edward Goldsmith and N. Hildyard, *The Social and Environmental Effects of Large Dams* (Powys. Wales: Wadebridge Ecological Centre, 1994), vol. 1, p. 79.

[12] Mira Shiva, 'Towards a Healthy Use of Pharmaceuticals: An Indian Perspective', *Development Dialogue*, 1985, (2), pp. 69–93.

[13] Ibid.; also Claude Alvares, 'The Dangerous, the Useless and the Needy', *Afkar Inquiry*, October 1986, *3*, pp. 26–33.

The relationship between the modern doctor and his patient, one part of the critique says, is increasingly characterized by attempts made by modern medicine to methodologically decompose the patient as person. True to the traditions of the positivist sciences, medicine tries to change the patient from an experiential reality to an experimental one, move him from his life world to the laboratory, reduce him from a molar to a molecular reality, and reinterpret his disease as somatic or psychological rather than psychosomatic.

The expression 'experimental' here does not mean that doctors experiment on the patient, though some doctors do and most doctors unwittingly endorse the vivisectionist base on which the consciousness–and the unconsciousness–of the experimental machine is built. 'Experimental' also does not mean that the patient ceases to be human to the doctor, though something of that too is involved in the change.[14] The expression refers to the reconstruction of the patient and his suffering into a set of variables and readings as in a laboratory process. It means that modern medical practice, even if temporarily and for the purposes of the clinic, *has* to give primacy to the laboratory reality of the person in preference to his personal and, as it happens, clinical realities. It is by suppressing the last two realities that the scientific enterprise called medical practice can be sustained. The process of suppression could be called depersonalization but for the fact that the term depersonalization is associated with a specific personality process in schizophrenia which, in its full-blown form, is independent of its social environment. We are here referring to what could be called a temporary depersonalization, socially imposed by a particular form of expertise which bases itself on the dualist worldview of modern science.[15]

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[14] See, for instance, Robert Lifton's deeply disturbing study of concentration camp doctors, 'Medicalized Killing in Auschwitz', *Psychiatry*, November 1982, *4*, pp. 283–97. Also *The Nazi Doctors* (New York: Basic Books, 1986).

[15] On this dualist worldview, involving a transition from objectivity to objectification, see Ashis Nandy, 'Science, Authoritarianism and Culture: On the Scope and Limits of Isolation Outside the Clinic', in *Traditions, Tyranny and Utopias: Essays in the Politics of Awareness* (New Delhi: Oxford University Press, 1987), pp. 95–126.

To give an example of another kind of reductionism involved here, the transformation of a psychosomatic reality to either a purely somatic case or a purely psychiatric (usually the former) does not mean that modern medicine does not have any space for the psychosomatic. It has. However, this space is reserved for a specialization. In modern medicine, there are three forms of illness–somatic, psychological and psychosomatic, each one requiring a different kind of professional expertise, whereas for some other visions of health there is only one form of illness–the psychosomatic. Some of them, such as homoeopathy, are discerning enough to add that while all illnesses are psychosomatic, some tend towards the somatic and others towards the psychological. That which is a categorization in one system becomes a scale in others.

The main point is that the doctor who trusts the voice of the patient more than pathological test results in his own clinical work is perceived as less scientific in his practice, even though he may be perceived as a more gifted healer and more respected as a practitioner. He may be respected as a doctor but not as a scientist and, though he may be considered successful by his community, professional honours and fame are likely to pass him by.[16]

This is because laboratory test results provide a series of readings from which it is possible to reconstruct the patient as a clinical body in which the doctor therapeutically intervenes. The readings, when seen as operational definitions of the reality of the patient, must have priority over the doctor's personal impression of the patient as a person and the doctor's clinical impressions of the patient as a patient. The latter are parts of a trans-science, as defined by Alvin Weinberg; their vicissitudes fall outside the science of modern medicine and the whole area is sometimes dismissively termed 'bedside manners'.[17] The former allow for control and prediction and are therefore seen as the heart of the science of medicine.

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[16] There is a shift in this respect from the earlier phases of modern medicine in India, dominated by larger-than-life physicians like Nilratan Sarkar (1861–1943) and Bidhan Chandra Roy (1882–1962), to the present phase when the most prominent figures in the world of western medicine in India are primarily researchers. See also the plague episode and Haffkinism discussed later.

[17] Alvin Weinberg, 'Science and Trans-Science', *Minerva*, 1972, *10*, pp. 209–22.

This shadow patient, the patient reconstructed from pathological test results, acquires a medical reality and autonomy of his or her own; it is with that shadow that the modern hospital is primarily concerned. The rest, that is the patient's personal and clinical realities, are seen by the medical system as variables that induce compromises—often major and necessary compromises—with the science (as opposed to the art) of medicine. They are not seen as variables having intrinsic scientific status. And because modern medicine is constantly trying to be a better science rather than a better art, the logic of the process pushes the discipline yet further towards viewing the human body as a complex machine.

The second part of the critique says that modern medicine has to conceptualize the patient as the sum of a finite set of sub-systems which, in turn, have to be seen, for therapeutic purposes, as relatively and functionally autonomous of each other. Each of these sub-systems, when affected by disease, have to be separately treated according to the needs created by the disease process which is seen as an external encroachment into one or more sub-system.[18] The treatment usually consists in entering the affected sub-system(s) with a 'counter-agent' or in intervening in the sub-system surgically. If in the course of this battle against ill health—the use of the term is common in the modern medical discourse—other sub-systems are affected, they are handled through another set of interventions, in the form of another set of drugs or another form of surgery. Previously such effects used to be called side effects; now they are called clinical iatrogeny.

It is possible to argue that the entire range of specializations in modern medicine is the direct outcome of such a perception of the patient. Specialists are increasingly regarded not as a tangential development or deviation from the primary agent of medicine in action, the general practitioner. The general practitioner is seen as a part of a residual category—that which is left behind after the specialists and the specializations are taken out of the field. In the medical utopia, therefore, there is no place for the GP. He or she is there today as a stop-gap measure. For truly scientific and fully developed medicine is viewed as definitionally the sum of medical specializations. Ideally such a medicine should not have any place for the generalist.

Obviously this way of looking at things is a far cry from the work cultures of many non-modern medical systems in which, because the patient/client is seen in holistic terms, the doctor is also expected to be a generalist first and specialist second. In fact the specialist, when operating in a non-modern system (for instance, the osteopath in ayurveda), often enjoys a lower status than the generalist.

The obverse of this issue is the problem of operationalism. If the patient's scientific reality is coterminus with the patient's operational reality as modern medicine seems to assume, then it is only this operational reality which allows the doctor—and through him society—'true', controlled intervention. The individual patient's health becomes assessable mainly from the central tendencies of a series of statistical distributions, on the basis of which the doctor predicts (prognoses), tests the prediction, reformulates the diagnosis, and alters the course of intervention. And the dialogue between doctor and patient is redefined as another input into a quasi-man-machine system constituted by the doctor and the laboratory. The limits to the system are set by the existing level of medical technology and the 'contract' between doctor and patient.

This gives scope in the medical discourse only for a monologue from the doctor and for either silence from the patient (the best patient is probably the one who considerately allows the doctor to do a *post mortem*) or for 'noise', the language of suffering used by the patient during consultation, a language only fit to be interpreted with the help of standardized categories of medical symptomatology.

In such a world, the doctor's sense of security no longer depends on his clinical, empathetic understanding of two sets of data, one derived from a clinical examination of the social reality of the person, and the other derived from the operational measures of the patient's body functions or dysfunctions. The doctor's sense of security begins to depend almost exclusively on the latter. Thus, for those interested in the art of medicine or in a holistic understanding of healing, cholera is caused by two sets of facts: (1) by poverty and the associated collapse of public health measures; and (2) by the cholera germs finding a habitat in an individual's body. For those seeing medicine from the worldview of modern science, cholera is caused only by germs and can be eliminated by vaccination or, after one has been stricken by the disease, through rehydration and maintenance of the body's fluid composition. The social context enters only the epidemiology, not the therapeutics. In the first case, the 'voice' of the victim is important; in the second case it is not.

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[18] This view of disease as an external process finding a habitat in the body could itself be an interesting subject of enquiry, because many other systems see disease as a basically internal process triggered by external factors. See section IV for an example.

Three Languages of Criticism

There are two ways of taking stock intellectually of the criticisms of the modern medical system in the savage world. The first is through empirical analysis, cataloguing its efficiency through an audit of births, deaths and health. Such analysis allows one to uphold some criticisms and reject others on 'scientific' grounds. However, such analysis also tends to become 'external' and focus on the political economy of medicine, on the sociology of hospitals or on the medical profession. The second approach to the task of stocktaking is by way of what may be called an ecology of knowledge. In this approach the modern medical system as a collective representation is made to confront the possibility of its Other. To make this simple point in the most complex manner we shall now shift our focus to the dialectic between the 'Self' of modern medicine and its Other, laying particular stress on the availability of alternative imaginations within which the dialectic works.

More specifically, we shall examine the intellectual critiques of modern western medicine within the Indian national movement. The period we shall consider is the post-Swadeshi period, but our analysis will be a freewheeling description drawn from mainly four 'archives': the feminist-theosophist-occult writings of Helena Blavatsky (1831–1891), Lind-Af-Hageby and Annie Besant (1847–1933), the neo-vitalist biology of Patrick Geddes, Gandhi's *Hind Swaraj* and G. Srinivasmurthi's construction of an ayurvedic critique of allopathy. These constitute what we shall call the archives of dissenting western imagination in alliance with indigenous knowledge systems in India.[19]

We choose such a period and its archives for three reasons. The debates in this era were pluralist. Parallel to the opposition between black and white, the colonizer and the colonized, was a deeper encounter in which western participants saw in India a possibility to be lived out. India to them was a place within which the other West of William Blake and Paracelsus could be revived. India in turn, seeking liberation from the West, nevertheless saw in the West an addition to the gene pool alternatives in knowledge available within India.

Second, the era anticipated the disrepute in which later critiques of western science sometimes fell. Today, such critiques are often seen as being associated either with passing fads or with obscurantism and authoritarianism. The possibilities of alternative medicine or science immediately bring to mind the years of Lysenko, the fact that Adolf Hitler was a great advocate of nature cures, that Mussolini was an anti-vivisectionist. We shall however argue that, instead of being the eclectic fads which some critiques of modern medicine are today, the debates of the post-Swadeshi era had a civilizational tenor to them. Also, there was in the debates a certain *naiveté*, a nakedness of intentions, which makes it easier for us to elaborate their strategies and consequences.

Third, we feel that in any reconstruction of a critique of a knowledge system, emphasis on only the nature of power encoded in the system is inadequate. One must concentrate on the content and strategies of dissent. All too often dissenting groups have sought the replacement of those in power without challenging the nature of the discourse. The critics become contextual and emphasize the social misuse of medical science; they fail to grasp the intrinsic nature of the science as a mode of cognition. The exoteric history of science, too, has concentrated on such overt processes, failing to show how esoteric critiques have provided ethical spaces from within which one can confront the hegemony of modern science.

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[19] The most important element in these archives is theosophy. Theosophy played a significant role in the Indian national movement. Allan Octavian Hume, generally regarded as the founder of the Indian National Congress, was a theosophist. Annie Besant (1847–1933), president of the Theosophical Society, was elected president of the Indian National Congress. She was also, as we know, a leader of the Home Rule Movement. Patrick Geddes (1854–1932), the Scottish biologist, came to India in 1914 to prepare a town planner's report on Madras. He was the first professor of sociology at Bombay University and the first English biographer of the botanist, J.C. Bose (1858–1937). Maria Montessori (1870–1952), who played such an important role in shaping the nationalist education policy in India, also had strong theosophical leanings.

II

The Theosophy of Alternatives

One of the most obvious illustrations of externalist critiques is the feminist movement and its critique of medicine. Official feminism has often stressed equality, without an adequate, built-in cultural critique of uniformity and standardization. It has not been a celebration of difference, of reciprocity. Such a feminism has basically left official medical discourse unchallenged. As a result, such critiques have merely enlarged the scope of the scientific gaze. We shall make this point by taking the reader through the works of Lorna Duffin and Jacques Donzelot, contrasting them with the efforts of occult feminism in the works of theosophically-inclined writers who influenced the Indian national movement.

Duffin's 'The Conspicuous Consumptive, Woman as an Invalid' is a remarkable study which shows that the perfect lady in upper class Victorian England was a perpetual invalid.[20] Duffin argues that the social construction of woman-as-the-perpetually-invalid could not have been maintained without the aid of the medical profession. Using issues of the *Lancet* from 1850 to 1890, Duffin describes the different strategies by which the medical profession, through the scientific definition and control of the woman's body, helped maintain the social inequality of women.

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[20] Lorna Duffin, 'The Conspicuous Consumptive: Woman as an Invalid', in Sarah Belamont and Lorna Duffin (eds.), *The Nineteenth Century Woman* (London: Croom Helm, 1978), pp. 26–56.

The picture that emerges is one of a classic double bind. First women were regarded as ill because they were women and, second, women became ill when they attempted to do anything outside the conventionally accepted feminine role. Both nature and culture were conscripted to maintain the status of the woman as invalid.

By defining the woman as ill, all specifically female functions were treated as pathological. Puberty, menstruation, pregnancy, labour, lactation and menopause, all became conditions that 'invalidated' the woman, rendering her incapable of mental or physical labour. 'The entire animal economy of woman,' as one doctor put it, 'is linked to the gigantic power and influence of the ovaries.'[21] A corollary to this was that all nervous disorders of women were linked to disturbances in the reproductive system. Robert Barnes in his Lumleian lectures of 1878 claimed that the convulsions of childbirth were indistinguishable from that of epilepsy. He added that 'at menopause, the nervous force no longer finding useful function goes astray in every direction'.[22]

Duffin notes that by defining all normal female functions as pathological, doctors also removed the control and management of pregnancy and childbirth from the hands of women and midwives, and placed them in the hands of male medical practitioners. It is thus easy to understand the responses of the medical profession to the entry of women. It involved another double bind. If women themselves become ill by transgressing the boundaries of the feminine role, protecting women from the hazards of the medical profession was a medical responsibility. Neurasthenia, Duffin shows, became a women's disease because it was allegedly caused by increased mental activity; she notes the increase of clitoridectomy and ovarectomy as cures for epilepsy, hysteria, sterility and insanity in women. Herbert Spencer in his *Principles of Biology* claimed that 'flat chested girls, who survive the high pressure of education' would be unable to bear a well developed infant or feed it.[23] On the other hand, reverting to the pristine purity of womanhood was reverting to illness, too.

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[21] Ibid., p. 34.
[22] Ibid., p. 36.
[23] Ibid., p. 33.

The history of the feminist movement chronicles the various attempts by women to liberate themselves from the bounded sexuality that medicine imposed on them. Particularly important were the efforts of Marie Stopes, Margaret Sanger and Annie Besant in her pre-theosophy days. Yet one senses that while they allowed for a greater role for women in the economic and political systems, they left the content of medical science intact. One could go further and say with Donzelot that the redefinition of the mother-child bond, so central to the feminist movement, was extracted at a heavy price.[24] For the new medical sciences like eugenics and psychotherapy used the feminist movements to widen the power of the scientific gaze. As a result, psychology escaped 'from the insane asylum' and established tutelage over the grid of social health that has now become central to contemporary medical hegemony. The process is similar to what Foucault describes in *The Birth of The Clinic*.[25] Foucault argues that the patient, particularly the poor patient, could avail himself of medical facilities only by opening himself up to scientific observation and intervention, by becoming an object of the new science of medicine.

In sum, the possibility of a feminist science was ignored in these attempts. Geddes and Thomson make this point clearly. They emphasize the need to make the most of the complementary qualities of women.

> It is important that medical schools and medical posts should be open to women of special aptitude. But from our general biological point of view, it seems that the most promising line of experiment would be that of providing specialized education for medical women—not 'easier' or 'lower' or any nonsense of that sort, but different—so that there might arise not duplication of one type of medical servant in the state but two distinct types of medical servant. It must be urgently emphasized, however, that the fittest medical education is not likely to be that which men in their wisdom prescribe, but that which women with a free hand, work out for themselves...

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[24] Jacques Donzelot, *The Policing of Families* (London: Hutchinson, 1979).

[25] Michel Foucault, *The Birth of The Clinic* (London: Tavistock, 1963).

> As Ellen Key has declared, 'to put women to do men's work is as foolish as to set Beethoven or a Wagner to do engine driving'.[26]

Geddes did not specifically talk of an alternative feminist science of medicine, but the possibility was entertained by some women at the time. There was a realization that the hegemony of medical science arose from the suppression of the Other as a patient, madman, child, woman and animal, that the liberation of women from medicine could only be brought about by liberating these suppressed Others. We shall now turn to the strategies theosophist feminism employed in formulating this awarenes.

To understand occult feminism, one must remember three facts. First, there was a realization among theosophist feminists that while liberty for women at one level was a result of secularization and rationalization, this liberty had a price. Women's participation in the eugenics and family planning movements had led to what may be called the semantic impoverishment of the feminine body, that is, the availability of signs, symptoms and symbols centring around the body diminished in the new social contract between the feminists and the medical establishment. The asexualism of industrial life was already eroding the 'essentially feminine' and, by 1917, there were already anxious reports about the decline of breast-feeding among working women.[27]

Second, the occult feminists realized the importance of treating the patient as a woman of knowledge. They realized that the mechanomorphic body of vivisectionist medicine, the elitism of eugenics, and IQ psychology gave little scope for the free play of the patient's knowledge or self-expression, and secondly, that the oppositions between nature and culture, woman and man, and the domestic and the professional had to be redrawn, and to do so they had to reshuffle the relationships between man, nature and God.

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[26] Patrick Geddes and Arthur Thomson, *Sex* (London: Williams and Norgate, 1914), pp. 233–4.

[27] G. Srinivasmurthi, *The Slaughter of the Innocents* (Madras: Author, 1917).

The occult provided the space for both sets of activities. The occult pluralized the materialist concept of the body by multiplying the number of bodies. The sheer availability of other bodies—the causal body, the astral body, the etheric body—created multiple realities and spaces within which new possibilities could be worked out. The reductionism of the materialist body was contradicted by the emergence of forms of consciousness and psychic powers that the presence of the astral and etheric body provided for.

Helena Blavatsky remarked that it never occurred to the physician that it was in the physiology of the mind—in the relationship of the conscious self and the body—more than in the material body that the causes of many maladies were to be found. The secret of healing resided in that relationship rather than in the molecular structure on which generations of doctors had toiled with little success.[28]

With the multiplication of bodies and forms of consciousness, the innumerable nervous disorders associated with women were reread. Hysteria, spirit communication, telepathy and clairvoyance all became spaces for a new freedom. They became spaces where the rules and regimentation of the official medical body were irrelevant. Simultaneously, an attempt was made to remove the various nervous disorders associated with women from the domain of pathology to the domains of the normal and the supra-normal. Charles Leadbeater cites one of the earlier instances, that of Anton Mesmer. He says:

> [T]hroughout his early experiments, he [Mesmer] was under the impression that magnetic sensitiveness was always a symptom of ill health; and it seems to have been a great surprise to him when he found that one of his patients retained her power after recovery. Further investigation led him to understand that it was not a question of health but a psychic faculty; and he conjectured correctly enough, that all in reality have the power to a greater or lesser degree; but in some it is only able to come to the surface when ordinary physical faculties are weakened by sickness.[29]

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[28] Helena P. Blavatsky, *Collected Writings* 1879–80 (Illinois: Theosophical Publishing House, 1966), vol. 3, p. 189.

[29] Charles Leadbeater, 'The Rationale of Mesmerism', *The Theosophist*, October 1904, *2*, pp. 29–40; see p. 30.

Partly as a result of such formulations, there was a virtual epidemic of occult and spiritualist happenings, in which women were the primary medium of occultism and spiritualism. There was literally a celebration of telepathy, spirit healing, reincarnation and clairvoyance. It was one of the few surrealistic periods in the annals of medical science.

The period also emphasized the importance of language and communication in the doctor-patient relationship. As Blavatsky remarked, not all prophecies and communications 'could be reduced to the same level with the hallucinations of the ventroloquist Mlle Amonda, whose delusions were due to vapours caused by the hysterical swelling of the large intestine'.[30] The statements of mediums, the language of hallucinations became important, though Blavatsky did add in a wry aside that:

> the great majority of spiritual communications are calculated to disgust investigators of even moderate intelligence. Even when genuine, they are trivial, commonplace and vulgar. During the past twenty years we have received messages purporting to come from Shakespeare, Byron, Franklin, Napoleon, Josephine and even Voltaire. The general impression made upon us was that the French conqueror and his consort had forgotten to spell words correctly; Shakespeare and Byron have become inebriates and that Voltaire has become an imbecile.[31]

Yet occult medicine was a genuine effort to restore the importance of speech in the doctor-patient relationship. In attempting this, it did add a truly semiotic dimension to modern medicine. It went beyond the reductionism of cause and effect, stimulus and response, to the world of signs, symptoms and symbols.

In such an exercise, the patient and the world of the patient became central. As important was the reconceptualization of the mother-child bond and its connection with the doctor-patient relationship. The diagram below gives an idea of the alternative visions of childhood so central to the theosophical exercise and the concept of medicine which went with it.

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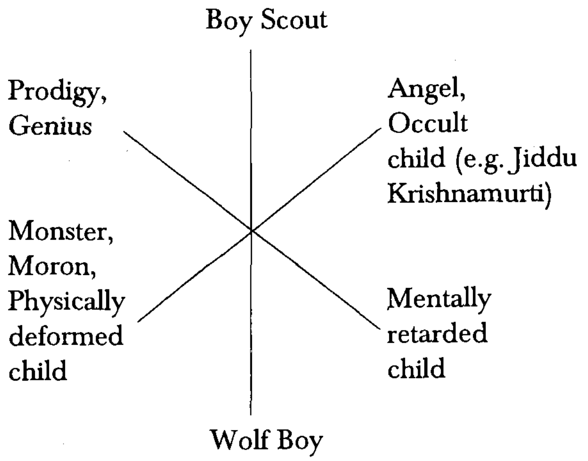
[30] Helena P. Blavatsky, 'Three Months in the Blue Mountains near Madras', *The Theosophist,* June 1910, *31*, pp. 113–20; see p. 119.

[31] Helena P. Blavatsky, *Isis Unveiled,* 1877 (Los Angeles: The Theosophy Company, 1968).


Boy Scout
Prodigy, Genius
Angel, Occult child (e.g. Jiddu Krishnamurti)
Monster, Moron, Physically deformed child
Mentally retarded child
Wolf Boy

The concept of the patient in such a framework gave free play to a number of women's basic selves–the pregnant woman, the patient, the mother seeking to understand childhood outside the narrow world of eugenics and modern medicine. The framework raised questions like: What is a foetus? What makes some foetuses 'monstrous' and others 'angelic'? How does one cope with or explain prodigies and morons? Does the foetus have rights?

The emphasis in these questions shifts from the demands of the scientific-medical world to the systems of meaning that women find relevant as women, mothers, patients and as parts of the folk imagination. The questions cut across nature and culture, and across the boundaries between the human, subhuman and animal. It is ethnoscience at its most autonomous, formed not by rejecting medical science but incorporating some aspects of it into a more meaningful bricoleurian world.

The problem of the monster–the entire teratology of deformed babies, those born with little tails, excess hair, withered feet, strange birthmarks, and other stigmata–was something that had always boggled the folk imagination. Theosophy, when it concerned itself with the problem, found evolutionist teratology neither sufficient nor convincing, for it left no place for reincarnation which was so important to the folk imagination. For the theosophists, too, only the cycles of birth and rebirth endowed biology with any sense of natural justice.

The re-emergence of the monster was accompanied by the resurgence of stories about the wolf boy, about children who had lived so close to animals that culture seemed minimal in them. The wild boy of Aveyron was part of both the folk and the scientific world. Attempts by doctors like Jean Itard to treat him were later to inspire Maria Montessori, the well-known educationist and the first Italian woman to receive a medical degree.[32] While working at a psychiatric clinic in Rome, she frequently visited the city's asylums where she found idiot children grouped indiscriminately with the insane. The early work on the wolf boy had convinced her 'that mental deficiency presented chiefly a pedagogical rather than medical problem'.[33]

If Montessori's first radical step was to demedicalize the problem, her second move, as many theosophists observed, was to alter the interventionist frame of mind in educationists and doctors. For Montessori, education was not what we do for the child, but largely something we refrain from doing, so as not to interfere with its growth.[34] The child, to Montessori, was a little messiah.[35] According to her, account had to be taken not only of the child's physical but also its psychic life–which for the theosophists included the spiritual life. Partly as a result, for Montessori, every parent, especially the mother, became a true scientist caring for the child. This spiritual humility, too, was radically different from the interventionist eugenics of the time.

The radical imagination of Montessori-as-a-doctor captured the spirit of the theosophists with remarkable sensitivity. There was no distancing of the professional from the non-professional here, for every woman could locate a Montessori within herself. Montessori's science was a science of demedicalization and deregimentation. It was not a medicine that preached the surveillance of the body in a barrack-like school. It did not pathologize the child in order to objectify him and thus legitimate further intervention. And though there was innocence here, and though the retreat of power was temporary—for her teachings were soon incorporated in courses of home science and scientific social work—for a while she represented the ideal medical scientist working as a participant observer.

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[32] Harlan Lane, *The Wild Boy of Aveyron* (London: Paladin, Granada, 1979).

[33] Ibid., 280.

[34] C. Jinarajadasa, *The New Humanity of Intuition* (Adyar, Madras: The Theosophical Publishing House, 1938), p. 129.

[35] Ibid., p. 134.

The feminist-theosophist imagination also counterpoised the wolf boy against the boy scout. If the former represented nature which had to be recovered for culture, the other represented culture reaching back to nature. However, theosophists had little sympathy for Baden-Powell's concept of scouting which was steeped in social Darwinism and coloured by imperialism.[36] Scouting was a form of social hygiene established to counter the threat of English national decadence and the lack of enthusiasm for the Empire. Baden-Powell was against free-feeding,old age pensions, and strike pay, 'for they did not make for the hardening of the nation'.[37]

What theosophy sought to do was to recover the other part of Baden-Powell and integrate it in an alternative frame which included the ecological consciousness, the romantic woodcraft naturalism of Ernest Thomson Seton, who had inspired the sections on woodcraft in Baden-Powell's book. A central feature of Besant's dissident idea of the boy scout, embodied in the Hindustan Boy Scout movement, was that the boy scout was kind to animals. The child thus became part of the anti-vivisectionism so crucial to the theosophist critiques of medicine as well as part of the movements for the rights of animals and of women in the West. The debate on the intelligence of animals, such as reports on horses that could count, were frequent in theosophist journals. Scouting lore, too, was full of anthropomorphic anecdotes. Gerald Carson later remarked, 'The zóologists may shudder but the anthropomorphic anecdote has made more friends for the animal kingdom than they have.'[38]

One last observation. As we have already said, there was an air of surrealistic biology about the theosophical framework. The theosophists produced a picture of a circus rather than a museum. The museum as a representative of modern science classifies defeated systems and alien bodies into the rigidity of a linear-evolutionary framework. The circus domesticates such alien bodies but allows for freewheeling imagination. The surrealistic bricolage of bodies in theosophy challenged conventional ideas of the normal and pathological. It was reminiscent of the role of the carnival in medieval times. To mix metaphors, Blavatsky and other feminists were like intellectual Barnums who had turned the world of medical knowledge into a circus juxtaposing folk jugglers and psychologists, Paracelsus and Darwin, the magician and the scientist, so that formal medical science lost its priority. To condemn this as quackery, fraud or pseudo-science is to miss the point. It is like saying Salvador Dali could not see straight. Theosophist attacks were like sociological stances, tactics against the hegemony of a domineering medical science. The strategy was simple: pluralize the number of bodies and modern medicine would find it difficult to regiment them. And this strategy had to involve India, for the theosophists discovered their circus in India. India, according to them, showed all the signs of being the site for an alternative medical imagination.

But the Swadeshi movement in India was already finding scientific medicine seductive, with Lala Har Dayal saying, for example, that 'a little science confers more happiness on mankind than all the piety of the middle ages'.[39] He noted that while Pasteur and Koch were not saintly ascetics, they were still greater benefactors of humanity than all the nurses of the religious organizations. For Har Dayal, modern science would be the Vedas of a resurgent India, and the scientist the model for the rishi-hood of the future. 'Do not ... follow the old footsteps of the rishis. Benares and Puri have had their day. What is there in Benares but... fat bulls and fat priests. What is there in Puri but choler ...?'[40] The theosophists, on the other hand, were afraid that Indian nationalism in its quest for

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[36] John Springhall, *Youth, Empire and Society* (London: Croom Helm, 1977), p. 57.

[37] Ibid., p. 57.

[38] Gerald Carson, *Men, Beasts and Gods* (New York: Charles Scribner, 1972), p. 121.

[39] Har Dayal, 'The Health of the Nation', *Modern Review*, July 1912, *12*, pp. 43–9; quote on p. 48.

[40] Ibid., p. 49.

liberation might internalize the violence of a desacralized western science. In fact, in the specifics of its critique of the Swadeshi movement, theosophy also became a critique of the Swadeshi internalization of vivisectionist medical science.

Vivisection has been defined as the justified infliction of pain on animals in the pursuit of science. As a scientific ritual it includes starving, baking, crushing, beating with mallets, fracturing bones, varnishing with pitch, subjecting to varying atmospheric pressures or to none, blowing up the body by forcible inflation, poisoning, amputating, burning and irradiating. The anti-vivisection movement in the early part of this century attempted to show how modern science legitimized the violation of the integrity of the Other when that Other could be defined as animal or, for that matter, as criminal, black, monster, poor or colonial subject.

This attack on vivisection has to be understood in terms of the career of public health in India. The introduction of vivisection in India involved what a gathering of Jains once called the rise of Haffkinism and Pasteurism in India. We borrow an example from Helen Bourchier's classic paper read at the 1907 Anti-Vivisection and Animal Protection Congress.[41] Bourchier contrasts the Hippocratic view of medicine as an ethical art and the modern laboratory view of medicine. She shows the contrast by examining two differing empirical approaches to plague–the first evident in the case of the plague in Egypt in the late nineteenth century and the second in the Great Plague of Bombay, which began in 1896 and lasted twelve years.

When plague struck Egypt, Sir John Rogers, who was then director general of the Sanitary Department, immediately instituted a series of measures. Persons found infected were isolated and those who came into contact with the patients were quarantined, fed and compensated for the loss of their time. These measures were

supplemented by others such as the lime-washing of infected houses, and the disposal of garbage away from the city precincts. As a result, the epidemic subsided within six months, the eventual death toll being a mere 45. Today, the Egyptian case is hardly remembered in the annals of science while the Bombay plague is cited as an example of the success of medical science.[42]

Bourchier shows that when the epidemic was raging in India and millions were dying, a group of doctors brought to Haffkine's notice the importance of introducing sanitary measures similar to the ones employed in Egypt. But Haffkine represented what they called 'the laboratory point of view'; he had come 'to test on man the remarkable results which he had obtained on animals in the laboratory with the cholera bacillus'.[43] He rejected their suggestions and ensured that no sanitary measures were undertaken while his vaccine was being tried out. He had his own ideas about experimental and control groups and about how far people in a colony could be used as guinea pigs for the sake of the progress of science. It is indicative of the culture of modern medicine that not only has the modern medical profession half-forgotten the Egyptian plague, it has deified Haffkine as the great healer and benefactor of the non-western world.

Theosophist editorials warned that the vivisectionist rituals of the laboratory state would soon envelop a whole series of 'others'. They referred to the proposed measure to legalize the vivisection of criminals sentenced to capital punishment in Ohio, USA. They warned that the logic of vivisectional science was such that:

> capitally sentenced criminals would be utterly insufficient to meet the demand for living human subjects and accordingly paupers, lunatics, hospital patients would have to be utilized. In short time, no poor and friendless person would be safe and at length all classes would find themselves exposed to this danger.[44]

Already hospitals had become so blatant that opportunities for vivisection were widely advertized in medical directories. Lind-Af-

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[41] Helen Bourchier, 'The Use to Which Men and Animals Alike are Put to by Men of Science', in Lind-Af-Hageby (ed.), *The Animal's Cause* (London: Animal Defence and Anti-Vivisection Society, 1909), pp. 75–98.

[42] Ibid., pp. 84–5.

[43] Ibid., pp. 85, 78.

[44] 'Cuttings and Comments', *The Theosophist*, March 1903, *24*, p. 382.

Hageby cites the example of the Charing Cross Hospital at London which claimed in an advertisement in 1907:

> From the extensive outpatient department, the most instructive cases were drafted into the wards for the benefit of the pupils and the outpatient practice as well as the special departments for female disorders, children's diseases, eye diseases and skin diseases are similarly admitted, affording valuable opportunity for surgical practice.[45]

St Bartholomews Hospital recommended itself in the following words: 'Hospital contains 670 beds, in addition to 70 beds for convalescent patients at Swanley, in Kent, there is therefore an abundance of clinical material.'[46]

The theosophist campaign against vivisection thus became a virtual charter of civil rights for the victims of medical violence, a violence which was now increasingly backed by the state. The theosophists insisted that the violence of modern medicine was not merely directed against distant or pathological Others; it was also the banal violence of everyday science. Thus, Annie Besant warned nationalist pedagogues against unnecessary dissections in science classrooms. Referring to schools in Europe she said:

> they repeat experiments of advanced scientific men in order to watch with their own eyes the results which they read in their text books. This is not done for the gaining of new knowledge, but is merely idle repetition of facts well established. For instance, a dog will be taken and laid upon the dissecting table, then the nerves will be exposed along the neck and under the skin of the legs, and while strapped in this condition, a sudden injury may be caused by the application of a red-hot iron, to a particular part of the brain and the dog will bark and the professor will brutally say to the public, 'See how we make the dog bark by stimulating this position of the brain.'[47]

Besant warned against such early brutalization in schools, and other theosophists argued that the entry of such a science into society

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[45] Lind-Af-Hageby, 'Vivisection and Medical Students: The Growing Distrust of Hopitals and Their Remedy', in Hageby, *The Animal's Cause*, pp. 88–97; see p. 95.

[46] Ibid., p. 95.

[47] Annie Besant, *Against Vivisection* (Benares: Theosophical Publishing House, 1986), p. 7.

could be dangerous. It was in this context that they opposed the inauguration of the Pasteur Institute in India.[48]

The advocates of vivisection, on the other hand, first propagated the fear of a disease, rabies in the case of the Pasteur Institute, and then offered science as a solution. Of this a theosophist said:

> westerners are awfully afraid of hydrophobia. It means death to them. Pasteur's Institute is supposed to be the only saviour and those that cannot bear the expense of going to it, must succumb to it sooner or later.[49]

'Yet in Indian villages,' the essay pointed out, 'there are always pariah dogs which bite villagers. They can never hope to get to Kasauli and are cured and live.' The theosophists emphasized the importance of vegetable therapeutics, of herbs from other systems, of alternative systems of medicine in general, particularly in the context of resisting vivisection. For instance, they pointed out that the usual prescription for rabies was the juice of the *ummetha* plant mixed with jaggery.[50] They seemed to feel the need to create life-giving myths or, if that was not possible, to give to the dominant medical system what, loosely following Arne Naess, we can call 'postulates of impotency'.[51]

The ideas of homoeopathy were often used by the theosophists as examples. Samuel Hahnemann and his collaborators had experimented on themselves with about 97 drugs. The results had been 'astonishing'. The symptoms of the drugs had produced faithful 'pictures' of everyday illnesses. Hahnemann's 'provers', in expressing their abnormality, had used the exact phrases encountered in interviews with patients. Hahnemann had also found that nine-tenths of the symptoms produced were subjective, that is, they required human speech to articulate them. These he had classified, a classification which has survived in homoeopathy till today. All this would have been impossible had he employed animals.[52]

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[48] 'Cuttings and Comments', *The Theosophist*, June 1903, *24*, pp. 565–8.

[49] K. Perraju, 'Extraordinary Virtues of Indian Plants', *The Theosophist*, October 1902, *24*, p. 23–27; see p. 23.

[50] Ibid., p. 23.

[51] Arne Naess, *Pluralist and Possibilist Aspect of the Scientific Enterprise* (London: Allen and Unwin, 1972). See ch. 5, p. 75–110.

[52] E. Petrie Hoyle, *Homoeopathy and Vivisection* (London: Animal Defense and Antivivisection Society, n.d.).

There is one other reason why the theosophists might have found homoeopathy attractive. We have already noted that one criticism of modern medicine is that it sees the patient not as a person but as a table of symptoms. Homoeopathy shares this critical view and, to counter what may be called the impersonalization of sickness, advocates the individualization—and repersonalization—of the patient's symptoms. For the homoeopath, every case is unique. The disease for which different patients may be consulting him may be the same, but the treatment should be different in each case. The physician has to consider the mental, emotional and physical pathology of each individual and the unique way in which the individual reacts to his illness. The clinical interview, therefore, becomes crucial for the homoeopath's work.

Let us now turn to another major, if indirect, theme in the theosophical critiques of modern medicine. To articulate the theme we have first to recognize that the history of power has become in many ways the history of the body as well as a historical catalogue of the various forms of body technique and discipline devised to control the body in the laboratory, barracks, hospital or school. To the theosophists, as to other dissenters of their times, medicine was becoming a legitimizing principle of the state. It allowed the state to inspect, survey and classify people in terms of medical categories—as insane, criminal or sick.[53] Sometimes the state even used these categories to exterminate or liquidate entire communities and races. The grand traditions of political theory have ignored this 'mundane' politics of everyday life. The abstract celebrations of market, state and sovereignty have time and again suppressed the awareness that medicine is politics, that it has provided the dominant metaphors of control and collectivization. Alfred Wallace once remarked that only two certificates were required from a registered doctor to send a suffragette into an insane asylum.

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[53] Michel Foucault, *Power/Knowledge* (London: The Harvester Press, 1980).

This compact between western medicine and the nation-state worried dissenters of the era. They realized that if health was power and the state a form of hygiene, the civil society must contain alternative notions of health, pathology and cure. The availability of such alternative imaginations was fundamental to contain, ecologically, the hegemony of the medical state. In the next section we shall return to this issue.

At a less ambitious level, there were the works of Wallace, a British advocate of the Swadeshi movement, and Geddes. Wallace exerted a great influence on the theosophists in India. To him the very success of science-as-a-mode-of-being was a sign of concern, for science could be coercive in its cognitive style, and its concept of method difficult to domesticate. The heretical impulse behind nineteenth-century mesmerism and homoeopathy was, to Wallace, an ethico-scientific imperative, which some scientists must follow to prevent the dominant system of science from becoming hegemonic. Wallace's book, *The Wonderful Century*, a history of nineteenth-century science, has an intriguing second half.[54] There he develops, after outlining the triumphs of western science, the ideas which were regarded as heretical by the scientifically minded—psychic research, phrenology, critiques of vaccination. (The heretical impulse also found expression in the Theosophical movement's paradigmatic scientist, Jagadish Chandra Bose. Bose introduced into modern plant physiology totally disjunctive ideas of life and matter which unfortunately were to get domesticated and absorbed eventually in the dominant structure of science.)[55]

The effort of Geddes was more collective. A maverick biologist, Geddes believed that the hegemony of a mechanistic science had coloured major areas of western thought—the physical sciences, economics, pedagogy, health and even the Haussmannic city with its celebration of linear planning and mechanical grids of roads, cutting across vital communities merely because they were poor or disease-prone. Geddes saw in his neo-vitalist biology the possibilities of a dialogue the West had suppressed, both within itself and with other traditions. It was in this context that he felt that India should be the site for a post-Germanic university.[56]

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[54] Alfred Wallace, *The Wonderful Century*, 1898 (London: George Allen and Unwin Limited, 1908).

[55] Ashis Nandy, *Alternative Sciences: Creativity and Authenticity in Two Indian Scientists* (New Delhi: Allied, 1980; New Delhi: Oxford University Press paperback, 1993), part 1.

For Geddes, no university system was complete without its dissenting academics. The career of the university as an organism often reflected a violent dialogue with competing notions of knowledge and pedagogy resident in its environment. Its very success lay in its ability to provide a working synthesis. For instance, the medieval university itself arose out of an attempt to reconcile the doctrines of the Christian church with the rediscovery of Aristotle. Similarly, he argued, the ideal culture of medicine should have physicians of many faiths, comparing not only their drugs but also their doctrines.

India, Geddes felt, could start such an exercise, which would, he hoped, lead to the revival of a rural view of science. He claimed that the economics of the leaf colony and the economics of metals were coming into conflict and that the first would once again have a larger significance, as it used to in the rural world of old. He hoped that young doctors from Edinburgh, London or Paris would go to study Indian diseases and interpret India's diverse cultural contexts to throw new light on European bacteriology, just as Calmette had brought back to the Pasteur Institute at Lille, to its brewers and bakers, a new yeast from old China, thus taking an industrial and a chemical step in one. In pursuit of such an idea of the university Geddes wanted Vishwabharati at Shantiniketan to embody both a scientific and aesthetic encounter with the West, but the concept lost out in Tagore's final blueprint for the university.[57] Swadeshi nationalists, on their part, defeated Geddes' hopes of designing the new university at Benares.

The other strategy to work out new relationships among various medical systems was a political one. In the 1920s during the debate in England over the registration of medical practitioners, Lind-Af-Hageby convened a conference on medical liberty and declared the right to medical freedom to be a civil right. It included the right to choose one's treatment, the right to do without a doctor, the right to resist the fashions of orthodox and unorthodox medicines.[58] In fact she forwarded a scheme for a Parliamentary party on medical liberty with some of the following objectives.[59]

1. To resist legislation by which the right of the individual to reject orthodox treatment could be abrogated and by which the prevalent theories of allopathic medicine would be identified with the state.

2. To spread knowledge of the various schools of non-conformist medicine and to demand for them the same liberty and independence as has been obtained by non-conformists in religion.

3. To work for the extended recognition of unregistered medical practitioners and thereby give facilities for the demand for systems of healing which were those in advance of the accepted modern school of medicine.

4. To safeguard the public against fraud by encouraging the various societies and bodies concerned with unorthodox practice to qualify and register their own practitioners and to promote an act of Parliament by which such qualified practitioners will be able to exercise their powers of healing without being molested and subject to criminal charges.

Hageby felt that given the power of the state, these rights had to be built into the social contract between the citizen and the state.

When the same question of registration and recognition of medical systems was debated in India, the emphasis was not only on contract but on the idea of the medical system as a commons. The practitioners of traditional medicine argued that it was a system of cure suited to the environment and lifestyle of the community both in terms of economics and culture. They presented these arguments in a series of reports, the most famous of which was the report of the Madras Committee under the chairmanship of Mohammed Usman (1923). What was revealing about these reports was the nature of the questions asked and the answers offered. The response of the traditional practitioners was similar to that of craftsmen facing the political hegemony of the factory. It was not that the modern factory was more efficient; efficiency after all can be judged by a myriad yardsticks. But the modern factory facilitated greater control over and surveillance of workers.

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[56] P. Geddes, *On Universities in Europe and India, Five Letters to An Indian Friend* (Madras: National Press, 1904).

[57] Ibid., p. 1.

[58] Ibid., p. 16; Lind-Af-Hageby et al., *Progress and Freedom in Medicine* (London: Animal Defence and Antivivisection Society, 1934), p. 2.

[59] Ibid., p. 7.

The basic question the traditionalists had to confront was whether traditional systems of medicine were scientific. The practitioners realized that what was being challenged was not the efficacy of the system but an alternative civilizational style.

> When we speak of our medical science they ask us with great wonder if there is indeed such a thing. Instead of posing such a question, if we first agree that there is such a thing as a Hindu people and they also like others have a religion, a language and a science and a great ancient civilization...[60]

The traditional doctors tried to show that their medicines were suited to the genius of the Indian people. They argued, for instance, that the ayurvedic system was particularly suited to the poor, that the food they prescribed was as cheap as their medicines. They did not require 'ice, icebags, thermometers, or even Pearl Barley, malted milk, essence of chicken, but could manage with herbs available right in their back-yards'.[61] Only gradually did the traditional doctors realize that the efforts were futile, for what was being built was an industrial grid.

The report of the Industrial Commission had appeared in 1918 and although it had been shelved by the colonial government, it provided the rudiments of the classificatory grid that was to underwrite modern society in India. Dissent or difference would have a different value in such a system.

[60] See 'Responses of Indigenous Medical Practitioners to the Madras Enquiry Sixty Years Ago', *PPST Bulletin*, June 1984, *4*, pp. 64–95, see p. 92.

[61] Ibid., pp. 71, 74. For an elegant parallel description of the same tragic process from the point of view of the Unani system, see Sardar, 'Medicine and Metaphysics: The Struggle for Healthy Lifestyles', *Afkar Inquiry*, October 1989, *3*, pp. 40–7. Also, Madras Group, 'What is the Role of Indigenous Medical Sciences in our Health Care System?', *PPST Bulletin*, June 1984, *4*, pp. 64–95.

Central to the emerging discourse on development, represented by the report of the Industrial Commission, was the following classification in which industry, science (medicine) and the nation-state were to be parallel rubrics:

Modern industry	Western medicine	Nation-state
Intermediate or medium-scale industry	Traditional medicine	Major religious or ethnic grouping
Cottage industry, Craft	Folk medicine	'Little culture'

Under each of these rubrics, the first category encompasses all those below it. It is primary, allegedly more stable and efficient, more bureaucratizable; it is literally paradigmatic in the sense Thomas Kuhn defines the term. The lower forms represent not the Other as a possibility—but defeated, 'unscientific' structures, to be absorbed, assimilated or marginalized. Thus ethnicities and local cultures were to be homogenized through the school, marginalized in the reservation, or museumized if disappearing. The logic of the intermediate or craft traditions could survive in the short run but would eventually yield, the argument went, to the all-absorbing power of multinational industrial empires. While modern medicine was aware of folk or traditional forms of medicine, it did not see them as parties to a dialogue or as an Other to be preserved; it saw them as a bag from which products had to be taken out.

III

Gandhi as a Medical Scientist

Two issues remained to be discussed: the possibility of every man becoming a doctor and the survival of a society without western medical doctors. Both were forcefully articulated in Mohandas Karamchand Gandhi's *Hind Swaraj*.[62]

[62] M.K. Gandhi, 'Hind Swaraj', in *Collected Works of Mahatma Gandhi* (Delhi: Publications Division, Government of India, 1963), vol. 4, pp. 81–208.

Gandhi's contribution to the debates on science and technology is usually described as a strange, anti-industrialist amalgam of an oriental Ned Lud and Ruskin. But the gestalt is radically different if one looks at Gandhi through his own eyes. Gandhi thought of himself as a scientist and regarded others as such. His autobiography, *My Experiments with Truth*, was literally what it claimed to be, the life and experiences of a scientist.[63] Viewed thus, his *Hind Swaraj* becomes a fascinating science policy document of the post-Swadeshi era, trying to resolve many of the problems that nagged the debate on science and technology. We shall briefly focus on the two texts to examine the alternative view of medical science they project.

Hind Swaraj has all the immediacy of a contemporary statement on science policy. Like all science policy statements, it presumes a relationship between truth and power. However, it grounds that relationship not in a political economy but in an ecological politics organized around a set of ethico-religious principles. Overtly, *Hind Swaraj* includes only a brief, trenchant critique of modern doctors, to parallel its critique of modern lawyers. Implicitly, it takes on the principle of the professionalization of modern scientific disciplines and the fact-value dichotomy which prompts modern society to locate the ethical controls on science outside scientific knowledge.[64] In this respect, the aphoristic essay resembles a Euclidean list of axioms. It holds that:

1. All critiques of technology must be ecological (*oikos* = house). [For Gandhi ecology, like charity, began at home. The household and neighbourhood were the prime units of concern.]

2. All notions of ecology are eventually ethical.

3. All ethics are eventually religious.

4. All religions are civilizational and, therefore, a critique of science and technology has to be a civilizational critique, encompassing the ideas of polity, economy and consciousness. [For Gandhi, however, civilizations could be both baselines for and subjects of social criticism.]

The Gandhian concept of modernity encompassed more than the fact of British colonial rule; modernity was the principle of modern western civilization. The British were the vehicles of oppression, carriers of a disease called modernity, and just as captive to its technological power. Thus, the existing concept of Swadeshi was inadequate for Gandhi because it failed to unravel and cope with the logic of modernity.

Underlying the argument of *Hind Swaraj* is the metaphor of the body, relating the human body to the body politic. The scale of the human body defines not only the nature of its activity, but also prescribes its limits. Modern mechanistic civilization is a disease because it violates the integrity of the body. The tool that a person works with, argues Gandhi, should be a natural extension of the body, not disjunctive with it. From these simple premises he outlines a critique of modernity, arguing that like colonialism, it is a self-inflicted disease, reflecting the dissipation of both the colonizer and the colonized. He illustrates it through his criticism of the railways in India. The simple fact of two styles of locomotion, on foot and by train, becomes a parable of modernity:

> God set a limit to man's locomotive ambition in the construction of his body. I am so constructed that I can only serve my immediate neighbourhood, but in my conceit I pretend to have discovered that I must with my body serve every individual in the universe. In thus attempting the impossible, man comes into contact with different natures, different religions and is utterly confounded. According to this reasoning, ... railways are a dangerous institution. Owing to them man has gone further away from his maker.[65]

The railways disrupted the Indian body politic, which Gandhi saw as a huge body digesting and assimilating different cultural elements. He then juxtaposed the two technologies, in an example contrasting pilgrimage on foot and by rail, representing memory and erasure respectively. The first pilgrim's progress was an act of faith. The arduous act of pilgrimage to different corners of India gave the pilgrim a sense at once of both neighbourhood and nationhood, helping him to internalize both similarities and differences. The mechanical negotiation or 'ingestion' of territory through rail travel erased the sanctity of places and turned them into physical spaces. For Gandhi, the modern machine set off a decline into the pathology called history, which was a movement away from nature. A return to nature presupposed a spiralling back to body time and body scale, to bodily discipline. According to him, Indian civilization reflected the social construction of such spirals of conduct.

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[63] M. K. Gandhi, *The Story of My Experiments with Truth* (Ahmedabad: Navjivan, 1927).

[64] Cf. Sunil Sahasrabudhey, 'Hind Swaraj and the Science Question', in Nageshwar Prasad (ed.), *Hindi Swaraj: A Fresh Look* (New Delhi: Gandhi Peace Foundation, 1985), pp. 99–105.

[65] Ibid., p. 28.

Gandhi also argued that the modern machine was an expression of unbridled appetite. Modern civilization was hedonistic, gauging progress in terms of calories and comforts and, thus, was necessarily hostile to the Indian concept of good conduct. He wrote:

> Our ancestors saw happiness as largely a mental condition. It is not that we did not know how to invent machinery but our forefathers knew that if we set our hearts after such things, we would become slaves and lose our moral fibre. They, therefore, after due deliberation decided we should only do what we could with our hands and feet. Real happiness consisted of the proper use of hands and feet.[66]

In a fundamental sense, Gandhi, J.C. Bose (1858–1937) and P. C. Ray (1861–1944) were the critical scientists of the Swadeshi and post-Swadeshi era. For each, the encounter with the colonial West became a crisis in identity. Each had to construct a social self in which modern science and technology were crucial targets of love and/or hate. Very self-consciously, each contributed to the social development of the scientist's role in India: Ray as the ascetic savant-entrepreneur, Bose as the scientist who used native ideas of vitalism to confound scientific classifications of life and non-life, and Gandhi as one defining the role of the dissenting scientist in modern India and by reaffirming the scientific role of the humble craftsman embedded in the folk traditions. However, Gandhi managed to do something more. He challenged the deeper axioms of science—the dualism of knowledge and power, religion and science, and the lay and expert.

As part of this challenge, Gandhi chose a medical science which was everyday in its immediacy—dietetics and hygiene. There was a certain playfulness to him, a certain 'cognitive indifference' to the products of modern science, as Ramachandra Gandhi put it in a personal conversation. Science, like western manners and dress, became, for him, something to be tried on, modified, or discarded. After all, borrowed etiquettes ultimately have to yield to the demands of hygiene and *svadharma*. At another level, the project was more serious and holistic. Dietetics, sexuality, technology—for him all were exercises in the pursuit of truth. The autobiography became an account of a continuing experiment, with the body as the test-tube; the discipline of the body served as a model for the civics of the body politic. Gandhi was concerned about how to embed science in everyday life and yet save everydayness from becoming banal, non-critical and coercive.

The answer Gandhi tried to give, according to his account of his formative years, involved a split-level encounter with the West. At one level, he was the young man from the colonies playing the anglicized dandy, with gold watch-chain, Gladstone collar, gloves, violin lessons, and speech lessons from Bell's *The Standard Elocutionist.* At another, he was a staunch vegetarian whose vegetarianism stemmed originally only from a promise made to his mother but was slowly becoming a philosophy. One of his friends, trying to dissuade him from it, suggested that he read Bentham on utility. Instead he picked up at a restaurant Henry Salt's *A Plea for Vegetarianism*, which he read and re-read.[67]

Vegetarianism in Gandhi's youth was not always a fad; it was a site for the location of alternative worldviews. It introduced him to the other West of occult philosophy, theosophy, various versions of socialism, and anti-vivisectionism as well as to Anne Kingsford's critique of diet and to Louis Kuhne's naturopathy.[68] They combined with his reading of John Ruskin and Leo Tolstoy to provide not only an alternative view of the West but also to help him anchor his own identity in traditions. Vegetarianism linked a traditional religious view of health to an alternative western philosophy of medicine. The writings of the vegetarians, the theosophists, Ruskin and Tolstoy had in common not only a hostility to mechanistic-vivisectional science but also contained the concept of the patient as his own doctor. Instead of experimenting on others, one experimented on oneself. Above all, as Salt put it, it was in the science of diet and hygiene that the opposition between western science and religion was resolved, creating the possibility of a moral science. Salt's work convinced Gandhi that food reform could lead to social reform. Indeed, vegetarianism not only equipped the Mahatma with particular kinds of political-ideological skills, as a number of his biographers note, it enabled him to work out the outlines of a critique of modern medicine.

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[66] Ibid., p. 37.

[67] Henry Salt, *Plea for Vegetarianism and Other Essays* (Manchester: The Vegetarian Society, 1886).

[68] Anne Kingsford, *The Perfect Way in Diet* (London: Kegan Paul, Trench, Trubner, 1889); Louis Kuhne, *The New Science of Healing* (Leipzig: Author, 1892).

The critique was underpinned by a philosophical sensitivity to three political-ethical issues. First, Gandhi's vegetarianism sought to recover the body as part of a search for individual autonomy, in turn representing a community-based search for the autonomy of small human aggregates—the notorious Gandhian village republics. For this, the vegetarian had to practise poverty, chastity and other forms of discipline, to accept the ethical and cognitive responsibility for his body and, thereby, reject medical processing by the state and by state-licensed medical practitioners.

Second, Gandhi identified in the body politic the pathological expression of three forms of violence—racism, prostitution and vivisection. These were not arbitrarily lumped together. Each form reflected a particular violation of the body and all three were epitomized in the parasitism of the city. The city was the home of censuses, epidemics and medical science. His experiences in South Africa had led him to connect racism, urban life and medicine. Both in Natal and the Transvaal, the presence of Indians in towns was objected to on sanitary and medical grounds, and the doctors had helped drive Indians out of towns into 'locations'. In response to this ultimate form of medical surveillance and to confront the triad of violence in a mechanical city, Gandhi formulated his idea of a non-industrial way of life, encoded within which was vegetarianism, anti-vivisectionism and traditional agriculture, along with the use of *khadi* and the *charkha*. For him they signposted the road to the recovery of the body.

Finally, Gandhi's thought incorporated the idea of iatrogeny but went beyond it. *Hind Swaraj* not only located the science of medicine in the colonial structure—'to study European medicine is to deepen our slavery', it says—the tract held the patient responsible for the persistence of the iatrogenic regime. Modern doctors helped perpetuate the urban-industrial civilization by disconnecting over-consumption and its bodily consequences. As a result, they not only destroyed 'natural' resistance to an expropriatory system, they actually guided the patient towards losing control over himself. From such a viewpoint, the immorality of modern hospitals was axiomatic and recovery of the body from the medical expert became both a moral statement and an affirmation of political-moral autonomy.

This was a more radical set of proposals than theosophy offered. Theosophy rejected birth-control and vaccination intuitively because they militated against its vision of childhood. Gandhi rejected citizenship of a polis where to be was to be inoculated. The clash between Gandhi and Besant is often interpreted as the struggle between Home Rule and Swaraj. Actually it was also a clash between the occult body and the mystic body. Gandhi's radicalism lay in offering a more playful, though less Borgesian, critique of science. Not only does every man become a scientist and every village a science academy in his critique, there is also a demand for a cognitive resistance to the gross appetite of modern science.

Few accepted his offer. The satyagrahi remained a political resister, too sedate to accept this invitation to an alternative vision of science.

IV

A Traditional Critique

The theosophists, despite being fascinated by the mysterious East, were primarily carriers of the underground traditions of western science. Their critique of modern science had to be sometimes a play on the absurd, given the near-total dominance of the target of their criticism. Gandhi's critique, on the other hand, was a more down-to-earth attempt to represent both the dissenting traditions of the West and the surviving traditions of medicine in his own society. Because he linked his theory of the body to his theory of politics on the one hand and the politics of culture on the other, his resistance to medicalization was necessarily part of a larger theory of resistance.

A third possible line of criticism still remains to be marked out: a critique of western medicine from the point of view of a traditional Indian medical system, unaided by critical western thought.

A brilliant critical response to western medicine was given in the post-Swadeshi era by G. Srinivasmurthi on behalf of Ayurveda. A remarkably versatile man, Srinivasmurthi was an outstanding Sanskrit scholar and man of letters who had translated the *Merchant of Venice* into Telugu. Though he described himself as a 'humble votary' of western medicine, he was a trained modern doctor, fashionable enough to become personal physician to John Barrymore, the actor. But while he respected western science, Srinivasmurthi was not awed by it. (In fact, he was prescient enough about modern science to remark in 1923, 'fortunately for the world, western scientists have not been able to release this [atomic] energy'.)[69] He had the bilingual's confidence that a dialogue between different medical systems was possible. His minute on indigenous systems was part of the Usman Committee Report, but can be read independently as an argument for a more plural encounter among medical systems.

Srinivasmurthi realized that the official history of western science acted as a filter, preventing the possibility of such an encounter. For the official history saw the scriptures and science as antithetical. Such a history could not be sympathetic to a medicine which cited the authority of the scriptures as one of the guides to right knowledge. Western science, he realized, would read such an appeal to authority as a 'petrified dogma', which denied the freedom of individual action so essential to their pursuit of science.

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[69] G. Srinivasmurthi, 'Secretary's Minute', *Report of the Committee of Indigenous Systems of Medicine* (Madras: Government Printing Press, 1923). p. 20.

Srinivasmurthi argued that the idea of scriptural authority in indigenous knowledge was radically different from that in the West. Scriptural authority in India did not have 'the sterilising touch ... that sought to burn away the tender seed of science which Galileo planted at the risk of his life'. The minute says:

> no one who has not entered into the very soul of Hindu thought can appreciate what scriptural authority means to the Hindu and how two persons paying the profoundest possible veneration to the same scriptural texts can yet interpret them in ways as diverse as the poles; a classic example that occurs to my mind is how all schools of Vedanta—from uncompromising duality (*Dwaita*) to absolute non-duality (*Advaita*)—purport to be based on the same scriptural text.[70]

The minute observes that no orthodox pandit would admit that the Vedas were in error, but one pandit could claim that his commentary was more in conformity with the truth of the texts than that of others. 'In other words, differences of views were expressed through commentaries on texts rather than by altering the texts themselves.'[71] This absence of dogma, and this playful invitation to a festival of interpretations, allows for as many commentaries and editions of the scientific method as of a religious text.

Srinivasmurthi notes that there are historical precedents for similar exercises in the West. He quotes William Osler's observation:

> the quarrels of doctors made a pretty picture in the history of medicine. Each generation seems to have had its own, the Arabians and the Galenists, the Brunonians and the Broussonians, the Homeopaths and the regulars have in different centuries rent the robe of Aesculapius'.[72]

Such differences, Srinivasmurthi feels, could lead to 'not unhealthy disputations'. He seeks a dialogue of medical systems similar to a dialogue of religions. The dialogue would not be a search for uniformity through a search for similarities. Nor would there be an attempt to mechanically translate terms such as *vayu*, *pitta*, *kapha* into wind, bile and phlegm, thus reducing Ayurveda to the old, abandoned humoral theory of the Greek physicians.[73] Rather it would be an attempt to grapple with systems and systemic differences, without strapping indigenous systems to the procustean bed of western medicine. It would not even be a search for equality between the intellectual systems of the colonizer and the colonized but a fraternal disputation on differences. The minute stresses the differences in the construction of the two systems, allopathy and ayurveda, and specifically mentions the mix of science, philosophy and religion in the native system. It points out that in Madhavacrya's *Sarva Darshana Sangraha*, which is a chapter-wise discussion of roughly sixteen religio-philosophical faiths of India, one finds, along with discussions of Buddhism, Jainism and Advaitism, a full chapter on *raseshvara darshanam,* or chemistry.[74]

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[70] Ibid., p. 11.
[71] Ibid., p. 11.
[72] Ibid., p. 8.

To the western mind such an arrangement of chapters would mean a confusion of the categories of science, philosophy and religion. A Hindu perceives it differently.

> The one supreme object of life is to attain the state of self realization or *Mukti*... Now the study of Chemistry helps me to achieve this object by intelligently using mercury and other chemicals in the healthy regulation of my physical and other bodies; here we see at once how the philosophy ... of chemistry is indissolubly associated with the science of chemistry and with certain ethical and physical practices broadly included under the name of 'Religion'–the religion if you please of Chemistry. As in chemistry so it is in Mathematics, Grammar, Exegetics, Ayurveda, or any other branch of study ...[75]

We should mention here the recommendation of the Usman Committee, that support to native systems of medicine should not be left only to the state but also be the responsibility of temples. The report recommended that some of the great south Indian temples take on the task of encouraging Ayurvedic and Sidha systems. This attempt to move beyond the secular idiom of the modern public realm reminds one of A. L. Basham's observation on the relationship between the Ayurvedic and Unani systems:

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[73] Ibid., p. 16.
[74] Ibid., p. 13.
[75] Ibid., p. 13.

> The practitioners of the two systems seem to have collaborated, because each had much to learn from the other and whatever the ulama and the brahmans might say, we have no record of animosity between Hindu and Muslim in the field of medicine.[76]

It is in this spirit that Srinivasmurthi ventures a critique of western medicine from an Ayurvedic vantage ground. An elaborate exercise, it centres on three related sets of ideas: (1) the opposition between external and internal conceptions of disease; (2) the relationship between the disease and the patient; and (3) the relationship between clinical and laboratory conceptions of disease.

Sociologically, one of the major oppositions between Ayurveda and allopathy has centred on the germ theory of disease. While modern western theory has generally looked at disease in terms of the diverse objective agents that invade the body, Ayurveda has looked at disease in terms of internal processes, triggered by external factors. Srinivasmurthi notes that while Ayurveda recognizes the role of micro-organisms, it does not grant them the centrality they possess in allopathy.

> They (the Ayurvedis) merely looked upon the germ as one among the many causative factors, capable of producing disease, if the soil or field (*Ksetra*) was suitable for the growth of the germ seed. It is when thc bodily constitution was undermined by the non-observance of the laws of health such as *Rtucary* (hygienic rules for various seasons of the year), *Dinacary* (hygienic rules for daily conduct); *Brahmacary* (hygienic rules for celibacy or regulated social life) and so on, that the *Ksetra* becomes suitable for the growth of germ seeds, which were powerless to do mischief in the case of people who lead pure and healthy lives ...[77]

Srinivasmurthi goes on to ask:

> Can the germ enthusiast say definitely that the cholera vibrio or the tubercule bacillus is *everything* in the causation of cholera or tuberculosis? ... Certain germs may be living for years in our intestines on terms of neutrality or even of harmonious helpfulness; but the moment something untoward happens to the intestines, they may at once grow unfriendly and

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[76] A. L. Basham, 'The Practice of Medicine in Ancient and Medieval India', in Charles Leslie (ed.), *Asian Medical Systems* (Berkeley: University of California Press, 1976), pp. 18–44; see p. 40.

[77] Srinivasmurthi, 'Secretary's Minute', p. 42.

> declare war. Now all these years the so called exciting cause was there but powerless to excite ... why should we not call the injury to the intestines the exciting cause and the bacterium the predisposing cause. They are apparently like seed and soil... It seems the *tridosa* theory looks at the question from the standpoint of the soil, while the germ theory looks at it from the standpoint of the seed.
>
> 'Keep out the seed–away with all germs and you are safe' that is the slogan of the germ enthusiast. 'It seems impracticable to keep out germ seeds which are ubiquitous. Therefore keep the soil in such a condition that no seed can grow, even if it gets there.' So urges the Ayurvedist.[78]

The question Srinivasmurthi asks is whether one should regard bacteria as the result or the cause. He asks as an example whether the term influenza denotes merely a group of clinical signs and symptoms or whether it signifies that influenza is caused by a specific germ. The answer, he believes, is unclear and unsatisfactory, and leaves one wondering why the germ theory has become such a fetish.

Ayurveda's 'agricultural view' becomes relevant in this context. Srinivasmurthi notes that western medicine has been prone to classify bacteria by their morphological characteristics, ignoring the wisdom of 'agriculturalists' who insist that what the bacteria do is more important than what they are. For example, an attack of Shiga dysentry or cholera will be mild or severe depending upon the intestinal content. If amino-acids are present in abundance, Srinivasmurthi points out, toxic amines will be produced, and the attack will be severe. If the diet has left little protein residue in the intestines, the bacteria will produce little toxic amines, and the attack will be mild.[79]

Srinivasmurthi goes on to say that even western medical theory has been moving away from the germ theory and assuming a more Ayurvedic position of attending to the soil, keeping it so that germ seeds cannot thrive on it. Even the informed laity, according to him, have realized that the active campaign to abolish bacteria is futile. He quotes a comment in *The Times* of London: 'the control of human resistance offers a brighter future than the direct attempts to eliminate disease.'[80]

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[78] Ibid., p. 13.

[79] Ibid., p. 46.

Apart from the possibility of a dialogue on the conceptual difference between external and internal concepts of diseases, there is also scope for a dialogue on styles of diagnosis. Srinivasmurthi cites Yamini Bhusan Roy to make the point that 'western doctors do not possess the key to the proper diagnosis of the patient though they are correct in their diagnosis of the disease'.[81] Allopathy pays little attention to the *prakrti*, the inherited constitution and idiosyncracies of the patient. The system has no place for ideas of *jati* (race), *kula* (tribe), *desha* (place), *kala* (time), *vayas* (age) or the *pratyagtama niyata* of body temperament (individual peculiarities).

On the basis of Yamini Bhusan Roy's and Gananath Sen's observations, Srinivasmurthi discusses the possible consequences of such a bias:

> While western medicine cannot help us to tell beforehand which of our patients is likely to suffer from quinine idiosyncracy, and which not, we are able, if we know how to diagnose our patient (especially his *prakrti*), according to Ayurvedic methods, to avoid making any mistakes about quinine administration ... western medicine has at present no means of recognising the patient's *prakrti*...It has to act more or less blindly, and learn from the bitter experiences of its patients.[82]

The stress on disease by itself rather than on disease-and-patient is identified as a by-product of the shift from the clinical to the laboratory view in western medicine.

> The laboratory worker obtains his results by a delicate mechanical contrivance, but the physician has to train his senses to recognize these different sensations. As a consequence of his inability to acquire this knowledge, he ignores information which it reveals particularly about the early signs of disease.[83]

Prognosis, according to the Ayurvedis, has been given inadequate significance in allopathy, even though much information exists about the stages of a disease. To the Ayurvedi, it seems strange that the importance of interrogation, the elaborate liturgy of procedures by which the doctor interrogates the patient, is disregarded in allopathy.

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[80] Ibid., p. 44.

[81] Ibid., p. 59.

[82] Ibid., p. 60.

[83] Ibid., p. 54.

The laboratory view of treatment is found objectionable not merely morally, as an instance of objectification, but cognitively:

> ... experiments on healthy animals may easily lead us astray; and it is fallacious to judge the effect of a drug on a human being by the effect it produces on animal; ... it is also fallacious to judge the effect of a drug on a diseased human being by the effect it produces on a *healthy* animal;... then again there is the clinical fact that two persons may not react to the same drug in the same way in two different conditions of ill health; in a very real sense then, every dose of a drug that we administer to a patient is a new experiment.[84]

Srinivasmurthi therefore wonders, given the discoveries of the botanist, J. C. Bose, if one may some day obtain from experiments on plants the sort of help presently derived from experiments on animals.[85]

Srinivasmurthi makes one final point about the cognitive capacities of the two systems of medicine. The Ayurvedic classification of diseases and treatments seems elaborate enough to provide 'readymade niches' for other forms of treatment such as allopathy, homoeopathy, osteopathy, Kuhne cure, vaccine therapy, psychotherapy, etc. This has saved it from the two perils of western medicine, namely, faddism and hyper-specialization. In Ayurveda (as in Hindu thought), there is no need to set up a closed or over-defined sect and proclaim it as owning a universal panacea. On the other hand:

> With our western brethern the case seems to be quite different. There, we have an ever-increasing number of medical sects, each with a special nostrum or formula wherewith to cure or charm away all the ills that flesh is heir to. Each may undoubtedly have a limited field of usefulness and applicability, but the danger lies in the attempt to transform it into a universal panacea ... One would cure all ills by osteopathy, another by chromopathy, yet another by homoeopathy, a fourth by allopathy, others by electricity baths, food reform, vaccine therapy, charms, incantations, miracle workings, magnetic healing, faith cures, denial of diseases, affirmation of health, and so on, till one fails to see the forests for the trees.[86]

Then Srinivasmurthi quotes Bernard Shaw on western medicine:

> Now Heart Break House was a hypochondriacal house, always running after cures. It was superstitious, and addicted to table rapping, clairvoyances, materialization, seances, palmistry, crystal gazing and the like to such an extent that it may be doubted whether ever before in the history of the world did soothsayers, astrologers, and unregistered therapeutic specialists of all sorts flourish as they did during this half of the century... The registered doctors and surgeons were hard put to compete with the unregistered. They were not clever enough to appeal to the imagination and sociability of the heartbreakers by the acts of actor, the orator, the poet, the winning conversationalist. They had to fall back on the terror of infection and death. They prescribed inoculations and operation. Whatever part of the human being could be cut out without necessarily killing him they cut out and he often died (unnecessarily of course) in consequence. From such trifles as uvulas and tonsils, they went on to ovaries and appendices until, at last, no one's inside was safe ...[87]

V

Knowledge, Consciousness and Dissent

We have here told the same story twice, once in our own language and then, in a more long-winded and colourful way, with reference to three strands of consciousness which emerged during the first three decades of this century in India. The second re-telling of the story has some specific implications. Through it, we have described three modes of dissent from modern medical philosophy in this part of the world. Each of these modes is simultaneously an attempt to understand modern medicine and to cope with the typical clinical, social and philosophical problems this mode of healing introduces into the world of applied knowledge.

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[84] Ibid., p. 69.

[85] Ibid., p. 69.

[86] Ibid., p. 62.

[87] Ibid., p. 63.

These constructions of modern medicine in non-modern terms are, therefore, three forms of meaning-seeking when confronting a politically powerful knowledge system which shows immediate practical results in some areas but is intellectually, socially and morally disorienting. From the irrationality-as-defiance of some of the theosophists to the culture-as-resistance of Gandhi to the indigenous-as-the-theory-of-the-exogenous of Srinivasmurthi, each construction evaluates the past in the light of the present, in an attempt to keep possibilities open for the future. Each construction in turn produces its own problems which are no less formidable than those produced by modern medicine. It is however an indicator of the power of the empiricism of life, as opposed to the empiricism of the academe, that the three responses together almost fully anticipate our summary description of the contemporary critiques of modern medicine in the first part of the paper. Admittedly, this anticipation is only sometimes self-conscious; admittedly, it often uses specific formulations which verge on the absurd; admittedly too, the anticipation is mostly the product of a self-exploration which sometimes tells us more about the attempts to restore self-esteem in the Indian middle classes than about the inner logic of modern medicine. Yet the fact remains that in some mutually potentiating way, the critiques converge because, even though they diagnose the illness of modern medicine differently, the clinical acumen which informs them helps the critiques to identify the broad contours of the problem similarly.

Beyond this convergence lies a paradox. Six decades ago, modern medicine was already triumphant in the West. But it was yet to become fully hegemonic on the Indian medical scene. The problems that are easy to identify today, when the crisis of modern medicine has 'matured', were then the concern mainly of cranks and visionaries. And the two categories, as we well know from the growing literature on the nature of scientific creativity, are rarely if ever exclusive categories. We have shown that 'demented' and other-worldly 'sages' diagnosed the crisis of modern medicine with greater clinical and philosophical perspicacity than did specialists and 'normal' scientists. Perhaps it is in the nature of a 'successful' modern knowledge system to push to the periphery all criticisms of the system and to ensure that they survive only in the form of artistic or fantastic imagination.

That these criticisms can sometimes return as the unconscious of the modern world is part of the same story. The story has to be retold if only to reaffirm that even criticism with limited access to empirical data, even criticism couched in the language of anti-empiricism, can show greater empirical sensitivity than those wedded to empiricism but unwilling to confront the problems of suffering without reifying them.

Atomic Physics: The Career of an Imagination

I

By World War II, capitalism had lost its poetic power, and the free market lay as a desiccated myth. At this juncture, science took over as the sustaining force of the liberal imagination. In the discourses of university dons, science was the model of communitas. The Republic of Science was deemed an open society, sustaining a creative tension between individual initiative and collective truth. In this more liberal world, the scientific method was substituted for the invisible hand and Popper and Polanyi became the Adam Smiths of this new regime.

This contemporary theology of science has been challenged from three perspectives. First, from within the philosophy of science itself, Thomas Kuhn has redrawn science as a totalitarian gestalt, observing heretically that science, like Stalinism, rewrites histories, in which the defeated become non-persons. Second, from political psychology (trying to come to grips with the Nazi phenomenon) came the writings of Arendt, Bettelheim and Frankl. They have shown that as rational structures the concentration camp and the research laboratory were easy bed-fellows, that Eichmann had the particularly prized quality we call scientific detachment. Frankl summed up this argument in his observation that the 'gas chambers of Auschwitz and Treblinka were ultimately prepared, not in some ministry or other in Berlin, but at the desks and lecture halls of nihilistic scientists and philosophers'.[1] Third, complementing these critiques in filigreed detail, if not philosophical power, are the writings of journalists chronicling the scandal called science: the works of reporters like Daniel Greenberg, Gordon Ratray Taylor and Edward Goldsmith. To this last genre belongs the work of the Viennese journalist, Robert Jungk.

Robert Jungk is the most comprehensive historian of the nuclear regime. He represents liberal humanism at its best—secular, rational, aesthetic, Erasmian; he is knowledgeable about evil but always surprised by it. This vision stems not solely from the impeccable sociography of a liberal humanist Jew, but also from his self-view as a survivor—he barely escaped death in a Nazi concentration camp. As the survivor of one holocaust, he has become the futurologist of another, goaded by the memory of one to warn against the possible occurrence of another. Jungk sees nuclear energy as cancerous imagination, and his books are an attempt to understand its career.

His *Tomorrow Is Already Here*[2] is a study of America as a threat to the liberal future; *Brighter Than a Thousand Suns*[3] is the classic history of the making of the atom bomb; *Children of the Ashes*[4] is a study of the survivors of Hiroshima; *The Big Machine*[5] is a gentler essay on the research laboratory CERN, where Americanized science sought to recover its lost European civitas; and, finally, *The Atom Staat*,[6] a statement on nuclear energy as occidental despotism.

Underlying the anecdotal richness of the books, one discerns a set of typological constructs that determines the structure of the narrative. These are the proverbial dualisms of western science: the hiatus between the secular and the sacred, sciences and humanities, truth and power, theory and praxis. Even in his moment of uniqueness, the scientist as hero remains a creature of this captive text. The theatre for the ritual enactment is inevitably the modern

[1] Victor Frankl, *The Doctor and the Soul* (New York: Vintage Books, 1973), p. xxi.

[2] Robert Jungk, *Tomorrow Is Already Here* (London: Rupert Hart-Davis, 1954).

[3] Robert Jungk, *Brighter Than a Thousand Suns* (Middlesex: Penguin Books, 1958).

[4] Robert Jungk, *Children of the Ashes* (London: Heinemann, 1961).

[5] Robert Jungk, *The Big Machine* (London: Andre Deutsch, 1969).

[6] Robert Jungk, *The Atom Staat* (*The New Tyranny*) (New York: Warner Books, 1979).

university. The modern university, in the classificatory organization of its faculties, encapsulated these dualisms, representing also a particular relationship between knowledge and power, and the various forms of knowledge as power.

Jungk sees nuclear physics as socio-drama. He observes that each age finds a peculiar site to act out its fantasies. It becomes a magical domain that attracts the most gifted and adventurous. Atomic physics possessed such a magnetic power after World War I. By that time, the researches of Rutherford, Bohr, Planck and Einstein had ruptured the nineteenth-century world of *fin de siecle* physics, altering the epistemic relations between subject and object, cause and effect, observer and observed. Physicists had begun their lovers' quarrel with the Newtonian world. It was a moment of discovery which became a moment of communitas: 'Old and young became comrades of this journey into the interior.'[7] Otto Frisch recounts an anecdote about Bohr's seminar, where:

> A young scientist [Lev Landau] sat down on a lecture bench tired from his walk and lay down flat on his back. In that position he continued arguing and gesticulating at Niels Bohr who was bending over him, earnestly trying to convince him that he was wrong. Neither of the two appeared to be aware that this was an unusual way of conducting a scientific discussion before an audience.[8]

At Munich, under Sommerfield, the conversation would move to the cafes where:

> Marble topped tables were covered with scribbled mathematical formulas. The waiters had strict instructions never to wipe the tables without special permission. For if a problem had not been solved by the time the cafe had closed for the night, further calculations were carried out the following evening. It happened fairly often that some unknown person would have the audacity to jot down the solution during the interval.[9]

Years later, when the mathematician John von Neumann emigrated to America, he longed for these cafes 'where one could gossip for hours over a cup of coffee'. He even thought of investing his savings in one such institution. When his American colleagues objected that the citizens of Princeton would not know what to do with a Viennese cafe, von Neumann replied, 'Don't bother about that, we'll recruit a few of our European colleagues. They will sit in my cafe every afternoon for a few days just to show you how it's done.'[10]

In Homeric epics, the bard would list the names of the ships sailing off to war, the very names sounding a magical incantation. Jungk's list of scientists who passed through Gottingen in those years is a similar incantation: the childlike George Gamow, the gentle James Frank, the American wunderkind Dirac and Pauli, Jules Robert Oppenheimer, Lev Landau and Norbert Wiener, Houtermans and Blackett, Fermi and Rabi and Heisenberg and Weizacker. The account reads like a troubadour singing of the romance of a distant court. These were the beautiful years of nuclear physics, of science at play, of discovery and communitas. That, combined with the epistemic openness of atomic physics, made up the paradigm for the liberal imagination. One is reminded of Rilke's lines—'a thing of terror conceived in a moment of beauty'.

In 1949, an old scientist in the company town of Los Alamos made a confession to Jungk. His outburst serves both as an epitaph for atomic physics and as the problematique of this genre of books. The scientist exclaimed:

> What an extraordinary and incomprehensible thing, my whole youth was absolutely devoted to truth, freedom and peace, yet fate has seen it fit to deposit me here where my freedom is limited, the truth that I am trying to discover is locked behind massive gates and the ultimate aim of my work has to be the construction of the most hideous weapons of war. Could fate have been more perverse?[11]

It is the Dostoyevskyian paradox of freedom culminating in tyranny and being resolved in a many-layered fashion. Jungk wonders repeatedly whether the subversion of science was caused by the external environment of politics or whether its perversions

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[7] Jungk, *Brighter Than a Thousand Suns*, p. 28.

[8] Otto Frisch, *What Little I Remember* (Cambridge University Press, 1979).

[9] Jungk, *Brighter Than a Thousand Suns*, p. 2.

[10] Ibid., p. 262.

[11] Ibid., p. 11.

were inherent in, and normal to it. What emerges is a split-level analysis—a synchronic portrait of the repertoire of roles available to the scientist during a crisis of conscience and a description of the basic changes in the structure of the nuclear regime.

Jungk is a master of what anthropologists call thick description. The multitude of anecdotes he provides coalesce into a choreography of positions available to science in relation to the violence of the atom bomb as a social fact. Within such a perspective, scientists like Einstein, Szilard, Teller, Bohr and Oppenheimer appear not as idiosyncratic figures but as permutations within a scientific code. Names become role tags listing various possibilities. The following table shows how.

Good Science, indifferent politics *Fermi*	Social organization as a model of politics *Bohr*	Use of politics to further science *Teller*	Political control of science *Szilard*
Scientization of politics *Von Neumann*	Scientist as political Prometheus *Klaus Fuchs*	Retreatism without retrieval *Einstein*	Renunciation *Helen Smith*
Restriction *Norbert Wiener*	Alternative Science *Nazi Science*	Good science, bad science *Hans Bethe*	Humanist Hamlet, Scientific Prometheus *Oppenheimer*

We begin with Enrico Fermi's statement, ‘Don't bother me about your conscientious scruples. After all, the thing is beautiful physics.’[12] It embodies a picture of apartheid science—aloof from politics. The accompanying positions reflect various amalgams of the scientific and the political.

The atomic scientists realized the irrevocable nature of the bomb which had triggered forces science could no longer control. They sought a Maxwell's demon to control the entropy of the resulting socio-political system. Inevitably, one of the first models offered was the social organization of science itself as a model of communitas. Archetypal of this attitude were the efforts of the Danish physicist, Niels Bohr. The great physicist believed that the scientific community was the homunculus of the future international order.

Pure science had managed to avoid the violence of war by sublimating it into agonal play. The scientific paper was a precious gift, and it circulated in joyous exchanges between the three centres at Cavendish, Gottingen and Denmark. Every conference was a kind of potlatch, each scientist showering the others with knowledge in return for eponymous recognition.

The internationalism of science withstood the pressures of war. When the English scientist, James Chadwick, was interned in a war camp during World War I, his German teachers, Nernst and Reubens, helped him establish a small laboratory where he carried out important researches. Even during World War II, Wolfgang Getner saved his former teacher's laboratory in occupied France. When the German was appointed director of Joliot-Curie's laboratory, the two sat in a cafe and drew up an agreement on the back of a menu card that Joliot's laboratory would never be used for research devoted to war. For Bohr, scientists were never at war. He hoped to use this internationalism of science to bridge the hostility between nations, particularly between the USA and USSR. Hoping to initiate informal contacts that would facilitate an arms control agreement, he approached Roosevelt and Churchill for permission. Of the fate of the first interview, we know little; but the report of the second reveals the endemic dualism of knowledge and power. Churchill listened to the physicist for half an hour in silence and then turned around to his scientific adviser and asked, ‘What is he really talking about? Politics or physics?’[13]

If Bohr proposed science as the model of the ideal polis, Edward Teller used politics to perpetuate science by promising to perpetuate politics. Lewis Strauss, chairman of the Atomic Energy Commission, once remarked that there were three kinds of scientists: pure, applied and political. The last category sums up his henchman; the father of the H-Bomb, Teller, was the first of the ‘sputnik scientists’ who embodied the scientist as a political lobbyist playing on military and political fears to obtain larger financial sanctions for research. All he needed to succeed was the sealing-wax morality of the *Reader's Digest* brand of anti-communism.

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[12] Ibid., p. 11.

[13] Ibid., p. 161.

There was a larger group of scientists who believed that it was only political organizations that could control science. These scientists, led by Szilard and Franck, participated in the democratic process, urging greater public understanding and control of science. Szilard and Franck represent the scientist as political visionary. By 1945, Szilard had already proposed international supervision of the entire product cycle of uranium. His futuristic measures included partial surrender of national sovereignty, Soviet police on American soil and vice versa. Ironically, while the scientist campaigned for the political control of science, the politician, with odd objectivity, realized that science as a text was politically indifferent. This increased the catchment area from which scientists could be recruited to further national policies. Jungk reports that despite the protests of scientists, the USA recruited former Nazi personnel who had worked on V-2 rockets to assist the armaments industry. Needless to say, Soviet Russia matched this ideological cynicism.

The indifference of science to context and ecologies makes it a powerful vector, an exponential virus. The effects are immediately obvious in the scientization of various domains, particularly modern politics, through the introduction of game theory. Game theory, which was an innovation of von Neumann; facilitated the planning of future nuclear wars. For von Neumann's computer, 'the end of the world was only one more question to be answered by calculation'.[14] Neumann's scenarios and the later ones of Herman Kahn represent science as a futurological exercise. They represent the eventual denial of the meaning of death in the scientific community, of Thanatos that lacks a supporting eschatology.

What frightens one is the poverty of language in these scenarios. The end of the world has been an important and continuous concern. Yet these impoverished scenarios lack an occult dimension, the poetry that magic and religion provide. They are numbers *sans* numerology, calendars *sans* ritual, the emptiness of clock time pretending to be history.

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[14] Ibid., p. 277.

When Oppenheimer was defeated in the struggle to control the superbomb, he summed up his reactions thus:

> I find myself in profound anguish over the fact that no ethical discussion of any weight or nobility has been addressed to the problem of atomic weapons... What are we to think of such a civilization which has not been able to talk of the prospect of killing everyone except in prudential game theoretic terms.[15]

Jungk sees this as the greatest threat to the liberal imagination; and we shall elaborate upon it later.

Returning to the repertoire of models, we now confront a most cryptic figure in the scientist-as-politician, Klaus Fuchs. Jungk's terse pages on him are fascinating and suggestive. They consist basically of two long extracts, one from an interview with the scientist's father, a Quaker pastor, and another from a long essay by a family friend, Margaret Hager.

In modern mass media as ersatz folklore, Klaus Fuchs is the scientist who betrayed a generation, the scientist who delivered the atomic secret to Russia. But in Jungk's report, the espionage-agent-as-traitor becomes a quiet Prometheus. Fuchs' act had all the irrevocability of the Promethean enterprise. It altered human history, shattering the American monopoly of the bomb, ironically unleashing the race for the superbomb. Like the Promethean gift, it was a stolen one and thus perpetually embedded in violence and guilt. Fuchs' father remarks: 'I can understand his extreme inward distress... He said to himself: "If I don't take this step, this imminent danger to humanity will never cease".'[16] If the Promethean spirit of arrogance and doubt adheres to any scientist, it is to Klaus Fuchs. Like Prometheus, Fuchs was forced to live with the strange ambivalence of the stolen gift. Like Prometheus, he was the real thief of fire; he stole fire from the men who played God. In his acceptance of punishment lies a touch of grandeur that Oppenheimer's later crucifixion does not possess. Yet, ironically, in a small way, the scientist as the political Prometheus is still captive to the scientific text. One of the opening lines of Fuchs' confession reads: 'My father was a parson and I had a happy childhood.'[17] The scienticized world has psychiatrized the language of guilt. One is almost afraid of a link between toilet training and the atomic bomb.

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[15] Noel Pharr Davies, *Lawrence and Oppenheimer* (New York: Simon & Schuster, 1969), p. 330.

[16] Jungk, *Brighter Than a Thousand Suns,* p. 173.

Margaret Hager, a family friend, contends that though by contemporary standards of morality Fuchs was guilty, she maintains that his deed ensured that 'nations, individuals and humanity at large might learn in principle where the present social organization is taking us'.[18] She believed that Fuchs' act was morally a stop-gap, safeguarding the human race in its forward movement to a more creative humanity. Hager's observations tempt one to complete the Promethean myth as in Plato's *Protagoras*:

> Then Prometheus, seeing man as defenceless, stole fire. Now men were in a position to maintain themselves from day to day. But each lived apart. When they tried to form communities they failed and quarrelled to death amongst themselves. Then Zeus, touched by pity for man, sent Hermes to make up for Prometheus' deficiency. Hermes brought to man the civic art of justice and order that men might live peacefully together on earth.[19]

In the final pages of *The Atom Staat*,[20] Jungk explores such a return to Hermes.

The description, so far, has sought to emphasize the political reconstruction of science. The next list of possibilities centres round the social construction of the scientific role itself. We begin with retreatism. Einstein, and, later, Oppenheimer returned to the seclusion of Princeton to speculate on the pure sciences. Their attempt marked the return of pure science to monasticism, but the monastery was the most exclusive of scientific clubs, the Institute of Advanced Study at Princeton. The Institute reflected the pursuit of pure science as truth leavened with humanism, seeking to build pathways between the 'villages of art and the villages of science'. Here the pure scientist had annulled the pretension of applied science to call itself scientific, contending that technicist science was an instrument of power. Einstein's retreatism was marked by intermittent forays into politics. He told Ervin Strauss, his scientific assistant at Princeton: 'Yes, we now have to divide up our time between politics and our equations. But to me our equations are far more important, for politics is only a matter of present concern. A mathematical equation stands for ever.'[21] His name continued to be associated with a rag-bag of pacifist movements. Jungk tells the story of Lew Kowarski, Joliot-Curie's associate. The Polish *émigré* scientist, later to spearhead the French atomic effort, once asked a group of young American academics what they were discussing. They replied, 'Oh, we are just wondering what we are going to say in Einstein's latest letter to the President!'[22]

There is a touch of Francis of Assisi about Einstein; the same compassion and gentleness. The secluded Princeton Institute in fact resembles the great monasteries of the Middle Ages seeking to preserve culture against encroaching barbarism. Yet, behind the music of intentions, one senses the same captive disjunctions between knowledge and power, the arts and the sciences, pure science and applied science. One is reminded of Walter Miller's fable of the nuclear age, *A Canticle for Leibowitz*.[23]

It is a tale of a strange epoch, in which a group of monks live in the wilderness preserving religion after the great cataclysm called the fallout. A young monk discovers within a sarcophagus, actually a fallout shelter, a circuit diagram and an accompanying set of words. Its meaning eludes the monks, but they treat it as sacred, preserving it in the finest calligraphy, as the relic of a great saint. Through gradual exegesis, they decode the diagram and its accompanying text, and the story ends with the world once again engulfed in a fallout.

There are two alternatives which Jungk mentions but never explores in detail. These are the possibilities of an alternative science and the notion of renunciation. He mentions the case of one of Max Born's English students, Helen Smith, who when she realized the possible applications of the atom bomb, gave up physics for jurisprudence. The renunciation of scientific research seems remote to the progressive rhetoric of science. Science can be organized, redirected, but not renounced. Implicit in the genetic structure of science is a technological Circe who programmes every 'can' to mean a 'must'. 'Can', a neutral statement of feasibility, is raised to 'ought', a normative imperative.[24] It is the can-implies-ought tenor of science that accounts for the instability of many of the solutions. Jungk hints that science as a cognitive system lacks a notion of restraint, the equivalent of an incest taboo. All it possesses is the proverbial package of dualisms. You can save the head but not the heart.

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[17] Ibid., p. 256.

[18] Ibid., p. 174.

[19] Denies Donoghue, *Thieves of Fire* (London: Faber, 1973), p. 29.

[20] Jungk, *The Atom Staat.*

[21] Jungk, *Brighter Than a Thousand Suns,* p. 225.

[22] Ibid., p. 225.

[23] Walter Miller, *A Canticle for Leibowitz* (New York: Bantam Books, 1959).

If renunciation appears remote, even self-imposed restriction seems problematic. But it is a pragmatic policy and deserves consideration. One recalls Heisenberg's observation that the self-imposed restriction of a dozen scientists in the 1930s would have halted the atom bomb. Ironically, it is the German scientists under Hitler—Max von Laue, Houtermans, Weizacker—who secretly decided that they would 'avoid working for Hitler's war machine or only make a pretence of doing so'.[25] Sadly, this is in sharp contrast with the almost paranoid frenzy with which Allied scientists went for the bomb. Jungk cites von Laue's statement, sad and sardonic, that 'no one ever invents anything that he does not really want to invent'.[26]

In the post-war era, a specific proposal regarding the restriction of scientific communication was made by the American mathematician, Norbert Wiener. Wiener believed that the scientist must take personal responsibility for the results of his research rather than hide under the cloak of value-neutrality. When an American armaments firm requested Wiener for one of his papers, he refused, stating 'that to disseminate information about a weapon in the present state of civilization is to make practically certain that the weapon will be used'. He added: 'If therefore I do not desire to participate in the bombing or poisoning of defenceless people—and I most certainly do not—I must take a serious responsibility as to those to whom I disclose my scientific ideas.'[27] Jungk reports that Wiener's ideas were decisively repudiated by the scientific community which contended, with a sense of the mysterious, that no one could predict the final consequences of one's research.

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[24] Hasan Ozbekhan, 'The Triumph of Technology: Can Implies Ought', in Standford Anderson, *Planning for Diversity and Choice* (Boston: MIT Press, 1968), p. 210.

[25] Jungk, *Brighter Than a Thousand Suns,* p. 95.

[26] Ibid., p. 94.

The necessity of an alternative science, that is, a science grounded in an altogether different metaphysics, was not seriously considered because of the coerciveness of immediate history. Possibly because of his faith in humanism, but also because of the spectre of Nazi science, Jungk himself dismissed the notion of such an alternative. The Nazi regime forced the dismissal of some of the finest physicists from Gottingen, replacing Jews with mediocre party functionaries. Jungk's sentiments regarding an alternative science are captured in an anecdote he relates about Gottingen in the Nazi era. About a year after the great purge, the mathematician David Hilbert was seated in the place of honour next to the Nazi minister of education. The minister asked, 'Is it really true, Professor, that your institute suffered from the departure of Jews and their friends?' The scientist replied, 'Suffered? No, it didn't suffer, Herr Minister. It just doesn't exist anymore.'[28] The perfidies of Nazi and Stalinist science have given the idea of an alternative science a parochial or totalitarian odour of politically distorted truth. Yet one feels today a deep need to work out the axioms of an alternative science. For example, the ethical power of the anti-vivisection movement needs to be separated from the fact that Hitler and Mussolini were its advocates. Faddism and political accident must be separated from the logic of an alternative metaphysics.

Jungk is ruthlessly honest in exposing the unstable nature of many of the solutions caught in the dualistic grid of western science as a collective representation. We observe cases of official science and extracurricular humanism, of atoms for peace and atoms for war. We have cases of scientists warning the public against the dangers of atomic warfare while simultaneously pursuing a science devoted to it. This instability marks the remarkable scientists' movement against the bomb. Inspired by Szilard, Franck and Einstein, the scientists' movement had all the innocence and futility of a children's crusade. Its initial successes were impressive. It was mainly because of their efforts that civilian control of atomic energy became possible. Even so, this great movement reveals the inadequacy of idealism by itself. To understand this, one has to see it through the cynical eyes of General Groves, overall military coordinator of the bomb. Leslie Groves is usually portrayed as a bumbling peasant among the aristocratic scientists of Los Alamos. Observing the scientists' retreat from the company town of Los Alamos to the freedom of the university, made the shrewd peasant in Groves retort that 'his little sheep would find their way back'.[29] He was right. By 1947, the scientists' crusade against the bomb had failed and they were trudging back to Los Alamos. 'What happened is what I expected.' Groves remarked later, 'After they had this extreme freedom for six months, their feet began to itch, and, as you know, almost everyone has come back to government research because it was just too exciting.'[30] Jungk analyses this pendulum-like swing between good science and bad science through the career of Hans Bethe, an outstanding physicist.

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[27] Ibid., p 260.

[28] Ibid., p. 44.

During the war years, possibly because he was an *émigré* from Nazi Germany, Hans Bethe felt no qualms about atomic research. But after the bombing of Hiroshima, his attitude changed. He felt personally responsible and became a leading opponent of armaments research. He left Los Alamos, returned to university and established at Cornell an outstanding centre for theoretical physics. Jungk's description turns biblical here. He reports that in the middle of 1949, 'That paradise of pure research was invaded by Teller, advocate of the Hell Bomb. Teller intended to lead Bethe to temptation. He begged him to return to Los Alamos for one year, since his collaboration in the production of the bomb was indispensable.'[31] When offers of money failed to work, Teller offered the prospect of knowledge, new insight into thermo-nuclear reactions and the opportunity of working with new computing machines, hitherto restricted to military uses. Bethe was flattered but hesitant. He sought the advice of his colleagues. He saw Oppenheimer at Princeton, but the scientist was ambiguous. Then, during a walk with his friends Placzek and Weisskopf, Bethe became convinced that in a nuclear war there could be no victors, for 'we would lose the very thing we fought for'.[32] Between 1949 and 1950, Hans Bethe still remained an extreme opponent of the bomb. He was among the twelve scientists who questioned Truman's ordinance to pursue research into the H-Bomb. These twelve condemned the act as genocidal, inimical to the basic tenets of Christianity. Yet by 1951, Hans Bethe, along with Oppenheimer, was participating enthusiastically in H-Bomb research.

Jungk asks, 'How does one explain such macabre enthusiasm which has swept away all earlier scruples and objections...?'[33] Oppenheimer himself provides a clue in his later ruminations:

> It is my judgement that when you see something that is technically sweet you go ahead and do it and you argue about what to do about it only after you had your technical success. That was the way it was with the atomic bomb. I do not think anybody opposed the making of it. There were some debates about what to do after it was made. I cannot very well imagine if we had known in late 1949 what we got to know by early 1951 the tone of our report would have been the same.[34]

It is this technicist imperative (what the scientist finds 'technically sweet', he finds nothing less than irresistible) that haunts Jungk.

Probably the most fascinating figure in this *danse macabre* is the American scientist, Jules Robert Oppenheimer. Jungk captures the idiosyncratic uniqueness of the man while revealing his archetypal qualities as a scientist. Even in the epic world of Gottingen, Oppenheimer acquired a legendary reputation as the wunderkind

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[29] Ibid., p. 221.
[30] Ibid., p. 229.

[31] Ibid., p. 250.
[32] Ibid., p. 253.
[33] Ibid., p. 226.
[34] Ibid.

'often improvising on the spur of the moment entire dissertations so that hardly anyone else had a chance to speak'.[35] But the prodigy of the Gottingen era realized that the Muses had eluded him in the later years. While his contemporaries—Pauli, Dirac, Heisenberg—had enormous contributions behind them, Oppenheimer was still not associated with any major discovery. It was at this stage that he was asked to co-ordinate the construction of the atom bomb. As a scientific orchestrator, Oppenheimer was a genius, truly the Toscannini of the atom bomb, a theoretical physicist with experimental brilliance, a polymath who could discuss Proust, Dante, the Gita and pure physics with equal verve, a fox among the scientific hedgehogs. Jungk repeatedly cites the zeal with which Oppenheimer pursued his study of the Gita or his explorations into literature. He recounts that Oppie joined the University of California at Berkeley because of a few old books—the enchanting collection of sixteenth and seventeenth-century French poetry in the library. In his preface, Jungk writes that if Shakespeare had to write *Hamlet* today, he would have made Hamlet not a prince but an atomic scientist.

What Jungk reveals, however, is a humanist Hamlet struggling against a scientific Prometheus. In fact, it is Oppenheimer who reveals the weaknesses of humanism in controlling science. When the bomb exploded, Oppenheimer was the man who exclaimed that the scientist had now known sin. Yet this is the same man whose role in the bombing of Hiroshima was described as providing a technical answer to a technical question, and who participated enthusiastically in the final plans for the H-Bomb. One has to confront the eerie power of the man. He is both innocence and evil, the idiot and the possessed, scientific sophisticate and political innocent, emerging eventually as the most Dostoyevskyian figure in modern science. The other roles mentioned become mere refractions of this archetypical portrait of the scientist as hero. Jungk unravels the structure of this modern myth brilliantly. His interpretation is reminiscent of Akiro Kurosawa's film 'Rashomon' where the same event is seen through three separate viewpoints. Similarly we have three separate variants of the Oppenheimer legend: Oppenheimer as the scientist crucified, followed by Oppenheimer as a self-confessed Judas. But the obviousness of the two stories screens the other equally real picture of Oppenheimer as Pontius Pilate. We begin with the first two versions.

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[35] Ibid., p. 29.

The post-war years saw the heightening of what Durkheim might have termed Oppenheimer's 'mana'. Unlike many other scientists who had retreated to their specialist warrens, Oppenheimer remained a public figure, a charismatic presence translating the esoteric adventures of science to the public at large. Aristocratically distant and yet strangely populist, to the common man he was the scientist as hero. But to the paranoid world of militarist America, he was the hesitant egghead, dithering over the H-Bomb, a rootless scientific intellectual and therefore a security risk. Adding drama to this was the struggle between the two scientists, Teller and Oppenheimer. The man who orchestrated the atom bomb was hesitant about the H-Bomb, while Teller was its most frenzied advocate. The militarist pressure groups manoeuvred an investigation into Oppenheimer's activities, and he was deprived of his security clearance. Oppenheimer became a scientific Dreyfus, stripped of his epaulettes by the country he served. The humiliation of Oppenheimer stirred the public, who saw in him the conscience-stricken symbol of the atomic age. 'Even before the proceedings had started, the halo of martyrdom was already bestowed on him.'[36]

The picture of the scientist as political martyr is then juxtaposed with the picture of the scientist as Judas, particularly because of Oppenheimer's self-confessed betrayal of Haakon Chevalier. In the mid-thirties, Oppenheimer had an elaborate but erratic network of leftist contacts, which he later abandoned. To the American intelligence this fact, however, made him politically suspect. Oppenheimer had been appointed director of Los Alamos despite their objections. Refusing to relent, they kept him under perpetual scrutiny. Succumbing to their hound-like persistence in attempting to identify his alleged communist contacts, Oppenheimer invented a colourful story of Chevalier as a communist agent.

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[36] Ibid., p. 287.

Haakon Chevalier, a lecturer in Romance languages in California, was a close friend of Oppenheimer. The two friends spent hours discussing Anatole France and Proust, and trying recipes in Oppenheimer's kitchen. Chevalier never realized that Oppenheimer was the one who had implicated him. He was subjected to continuous harassment and eventually forced to leave for Paris, where he worked as a translator. Unaware that Oppenheimer was the source of his troubles, Chevalier wrote to him for help in obtaining a security clearance. The two friends met in France in 1953, when Chevalier recounted his problem again. Even at this time, Oppenheimer did not confess to betraying Chevalier. On taking leave, he embraced him and his wife. Haakon Chevalier was to shudder later at the recollection of this parting gesture.

The dramatic power of the two variants cannot be denied. The trial of Oppenheimer had all the stuff of drama: the anguish, doubt and ambiguity of a conscience-stricken scientist. The Chevalier affair adds to it. It emphasizes the human frailty of the man in power. The composite picture is that of Oppenheimer as Dreyfus-Galileo, ersatz images that emphasize vulnerability to disguise power. But the subversive power of modern science as myth lay precisely in this. It transformed the vivisector into the sacrificial lamb. As subtle a historian as George de Santillana wrote an essay exploring the similarities between the Oppenheimer and Galileo trials. Even the struggle of the survivors of Hiroshima lacks the mythical power, the poetry of the trial and exile of Jules Robert Oppenheimer. The FBI once convicted the gangster Al Capone for an income tax evasion, an irony which escaped no one. But history offers a greater irony: Oppenheimer was convicted falsely and thus enabled to escape the serious charges. The trial of a war criminal was obfuscated by a petty conviction. It is this seeming innocence that we must confront, an innocence hiding genocidal intent. The portrait of Oppenheimer as Judas Iscariot obscures the element that is missing in the triptych: Oppenheimer as Pilate washing his hands off genocide.

We are not merely talking of Oppenheimer's fascination with power, his need to cling to it. Many of the younger scientists were disappointed that he distanced himself from the scientists' crusade against the bomb, with his truth-by-expert-committee approach. They felt that the scientist who claimed he had known sin had made no suggestion as to how he might show remorse in practical form. We are not even considering his pendulum swings between official science and extracurricular anguish. What makes him Pilate is the eerie innocence of pure science washing its hands off genocidal guilt.

Talking to a French diplomat after the war regarding the prospect of establishing a supra-national European laboratory, Oppenheimer emphasized that the proposed laboratory should be devoted, not to the development of atomic energy and nuclear engineering, but to pure, application-free, fundamental research. Oppenheimer added in the course of the conversation that 'the bomb was in fact no more than a gadget. Now we should be allowed to return to deeper problems.'[37] The finality and naivete of this statement is amazing. It is as if he had dismissed the applied scientist, the Faust, in him as an aberration. One is reminded of the equally atrocious statement cited by that hagiographer of science, C.P. Snow, that 'when the bomb exploded the scientists were sad and the technicians happy'. This kind of statement can disguise two falsehoods. First, it ignores the technicist imperative within science; and, second, it ignores the scientists' responsibility for the bombing of Hiroshima.

Much is made of the feud between Teller and Oppenheimer. But this struggle only disguises the vivisectional unity of the two opponents. Teller appears as a one-dimensional Oppenheimer, the scientist who had stopped reading his humanist classics. Yet, despite such differences they merge into one another. Both co-operated in the making of the H-Bomb. Oppenheimer does not lose to Teller, he becomes Teller. Behind the occasional humanist anguish is the modern death mask. Oppenheimer is no longer the scientist who has known sin. One senses no pain in him. It is as if he had computed the atomic weight of a new element and moved on. There is no atonement. In Oppenheimer's career we observe not the resolution of moral anguish, but the bureaucratic closure, not heroic denouement but the closing of a file. The scientist as hero

[37] Jungk, *The Big Machine*, p. 36.

collapses into the organization man. A man who had read Dante turns out eventually to be a clerk. He who boasted of having read the Gita remains only a fragile humanist. This eventually raises an important question: can humanism control science, deepen it? Or is it only a quarrelsome sibling, competitive but eventually complementary to it? Jungk attempts to answer the question through a diachronic portrait of the nuclear regime.

II

The writings of Jungk possess a mimetic quality in the manner in which each work mirrors the epoch described. *Brighter Than a Thousand Suns*, a study of the physicist as the fallen hero, has an epic quality about it. Science in this era possessed hints of the medievalism of both chivalric knighthood and craft guilds. *Tomorrow Is Already Here*, on the other hand, a portrait of industrialized science, has all the terseness and immediacy of a newspaper report. It is almost a subversive mimicking of the manufacture of information in a mass society. The difference in style between the two books provides a clue to Jungk's perception of the changes in the nature of the nuclear regime.

Jungk discerns three major changes in the movement from one epoch to another: the degeneration of science as play; the shift within science from epistemic uncertainty to vivisectionist hegemony; and the displacement of science from the university to the company town. All three are symptomatic of the transformation of western liberalism into occidental despotism, heralding the coming of the atom staat.

For Jungk, as for many western intellectuals, the university, rather than the market-place, was the seedbed of the liberal imagination. Unlike the market, which eroded the fraternity of the medieval aristocracy and craft guilds, the university employed heraldry, chivalric codes and craft rituals to create and maintain the fraternity of a modern democratic knowledge system. While both market and university emphasized formal freedom, the latter was successful in embedding it in a framework of communitas. Robert Jungk is fascinated by the ludic quality of the modern university, the domain of play. The early years of nuclear physics were the beautiful years precisely because they were the playful years. Jungk does not formally employ the notion of play, but it is implicitly present in his ethnography of the physics at Gottingen.

The category of play[38] seeks to understand a cultural form that transcends the more mundane sociological dichotomy between work and leisure, between the serious and the non-serious. Baldly stated, play is any rule-bound voluntary activity, conducted within strict but arbitrarily defined limits, disinterestedly pursued without any specific intention of material gain. As an aesthetic form, it embodies a search for order. Jungk perceives pure science as a distinct play form. The paradigms of pure science embody a search for order; and as order is a thing of beauty, therefore the affinity of pure science to aesthetics. Pure science is *theoria* which justifies itself in terms of poesis rather than praxis in that the performance of the scientific act is legitimate in itself. From this we derive the notion of science for science's sake. Rules become important in this context, and any deviation, such as the search for utility, threatens the very existence of play. It was this sense of play that made Rutherford insist that his work on the atom was useless, for his was a search for order and beauty, not utility. More particularly, it reveals the understanding that pure science as play must be conducted within strict limits, that play is always enacted within a bounded space that must not be ruptured.

One is reminded of Jungk's story of David Hilbert. While addressing a Gottingen meeting, the crusty mathematician remarked: 'One hears a lot of talk about the hostility between scientists and engineers. I don't believe in any such thing. There can't possibly be anything in it because neither side has anything to do with each other.'[39] What appears as the arrogance of the pure scientist embodies a deeper grain of wisdom. The osmotic distinction between pure science and applied science is the only system of in-built control which prevents the erosion of pure science as a play form. Pure science as play also embodies a notion of seriousness. Jungk narrates a story about Rutherford. Failing to attend a British defence meeting on enemy submarines during World War I, the New Zealander was censured for his absence, but retorted without embarrassment: 'Talk softly please. I have been engaged in experiments which suggest that the atom can be artificially disintegrated. If it is true, it is of far greater importance than war.'[40] Huizinga notes that play can rise to the heights of beauty and sublimity which leaves seriousness far beneath: 'The inferiority of play is continually offset by the superiority of its seriousness.'[41] This statement captures the cosmic playfulness of physicists like Bohr, Rutherford, Einstein and Pauli in the beautiful years. Yet, paradoxically, the seeds of the atom staat lay in the eerie innocence of this ludic community.

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[38] Johan Huizinga, *Homo Ludens* (Boston: Beacon Press, 1955).

[39] Jungk, *Brighter Than A Thousand Suns,* p. 24.

Pure science as play was an aesthetic form sans ethics. In emphasizing the dangers of pursuing science for science's sake, Jungk recounts his encounter with a mathematician he met on his last visit to Los Alamos. 'His face was wreathed in a smile of almost angelic beauty. He looked as if his gaze was fixed upon the world of harmonies. But in fact he told me later he was thinking about a mathematical problem whose solution was essential to the construction of a new type of H-Bomb.'[42] Jungk adds that this scientist never bothered to watch the trial explosion of any of the bombs he had helped produce. To him 'research for nuclear weapons was just pure mathematics untrammelled by blood, poison or destruction'.[43]

Play remains play because of its sense of limits, a realization that it embodies an imagined world played out within strictly defined limits. It is the degeneration of the play form and its contamination of the serious that horrifies Jungk. This occurs in two ways. First, science as play is taken over-seriously and, like other play forms such as modern sport, becomes overorganized. As science gets managerialized it is bereft of its playfulness, consequently losing its

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[40] Ibid., p. 15.

[41] Huizinga, *Homo Ludens,* p. 15.

[42] Jungk, *Brighter Than a Thousand Suns,* p. 13.

[43] Ibid., p. 14.

celebration of artlessness, gladness and detachment.[44] The second process involves the contamination of other domains by degenerate forms of pure science. Jungk cites the example of the entry of the game theory into such serious domains as death, work, sexuality and politics. Game theory in these domains represents the degeneration of the ludic into the ludicrous:

> These methods were spawned in the weapons laboratories of World War II to be tested on major military objectives. 'Thinking about the unthinkable' (as Herman Kahn put it) became the fashion and researchers staged elaborate games that took into account the destruction of entire nations and continents. This gave rise to an entire generation of scientifically trained gamblers oblivious of the inhuman implication of their models. At first only confined to military sciences, their methods have entered the civilian sector and found credence and application in governmental planning at all levels, including the decision making of the industrial complex.[45]

What impresses one is the reduction of the polysemic worlds of life and death to the formal language of the game. The resultant poverty of language is astonishing. Even death is no longer a cosmic phenomenon, only an option to be weighed. Neither genocide nor nuclear destruction are grasped through the wisdom of ordinary language. In the world of these new scientists, there is no cosmic rupture, only another managerial game where guilt, death, sin, all get coded into the selfsame uniform flow to be controlled as a game or sport. Not that science as play is not conducted in formal language, but it recognizes certain limits, realizing the polyvocality of ordinary life. Science as a puerile game attempts to reduce the world to a series of formal languages. The destruction of language anticipates the hegemonization of the atom staat.

It is the absence of an effective system of in-built controls in science that worried Jungk: that science has no innate sense of the sacred, of limits, of what it must not touch or must touch gently. Jungk reiterated that within the structure of the university community, the world of science finds its only checks in the humanities. The ethnographic intensity with which Jungk details the various leading scientists who read poetry or philosophy is fascinating. He emphasizes that Oppenheimer read Proust and Dante, that Teller wrote poems in secret and even translated the Hungarian works of Ady, that Heisenberg read Trollope. The humanist in him insists that he who has read Goethe cannot be a Faust. But the journalist in him catalogues the technicist imperative of science, the inability of the humanities to recode the scientific text in a more ethical direction. Jungk suggests that what made science impervious to the humanistic idiom was the vivisectional paradigm encoded into it. While the degeneration of pure science as play involves an alteration in form, vivisection relates to the very content of science.

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[44] Johan Huizinga, 'Puerilism', in Robert Boyer, *Psychological Man* (New York: Harper, 1975), pp. 124–30.

[45] Jungk, *The Atom Staat,* p. 59.

III

Between the Cartesian machine and the vivisectional code there lies a vital difference. The Cartesian machine was not half as hegemonic as the latter. The ritualistic segregation of mind and body did recognize limits, allow for spaces which were non-, un-, pre-, scientific. It allowed for differences even if it hierarchized them. Vivisection, however, is indifferent. Everything is mechanical, so there are only more—or less—efficient machines. The laboratory, far from defining the limits of play, becomes the paradigm for the managerialization of the world. It is this that Jungk captures in *Tomorrow is Already Here.*[46] Science, to the liberal mind, represented knowledge contra power. But vivisection conflated the two by emphasizing the power of science as hegemonic truth. The politicization of science has unleashed the hegemonic power endemic in science.

The epistemic uncertainty of early quantum physics now appears an aberration. For a brief period it had returned the subject back to physics. But the machine was eventually to reassert its hegemony. The career of this cycle can be compared to equivalent phases in the other paradigm of modern science—management

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[46] Jungk, *Tomorrow Is Already Here.*

science. Scientific management under Winslow Taylor represented the Newtonian predictability of the object. The Human Relations School was temporarily overwhelmed to discover the importance of man as subject in the problem of productivity. Human relations, like quantum physics, occasionally celebrated uncertainty or free will of the subject. But the eventual response was to eliminate man, or to incorporate a less fallible man back into the mechanical code. Science built into its experimental procedure a more formalized vivisectional code, for it realized that that which it could not predict it could not control. Vivisection provides such a guarantee by scientizing the world.

For Jungk, the history of the body becomes the crucial variable for liberalism, so that the fate of the body as metaphor embodies the fate of a civilization. To the liberal mind, the body determined the boundary between the self and the Other, and the relation between public and private domains. Liberalism believed in technological progress where the machine was an instrument of man, an extension of his body. The iconography of liberal *homo faber*, while it lacked an occult sensibility, portrayed the tool as an extension or projection of human sensibility. The body was the grid for the technological imagination, the hand and foot a measure in more than one sense. Vivisectionist technology introduced an inversion into iconography. While man hegemonized nature by mechanizing it, he himself entered into a perpetual foetal relation with the machine.

Jungk cites the picture of a modern pilot umbilically linked to a complex circuit of machines. Every act of technological control necessitates a further foetalization of man. The picture that comes to mind is Bruno Bettelheim's report on an autistic child, Joey, who insisted he was operated by machines. He had plugged himself to an elaborate support system made of radio tubes, light bulbs and breathing machines. During meals, he plugged himself into a socket to facilitate digestion. To Joey, the fact of having a body was insufferable. Security derived from being a machine, because if the parts were bad, they could be replaced by more effective spares. Joey treated his mind and body as mechanical parts to be discarded or replaced if they functioned badly. 'If he spilled something, he would remark, "I must break my arm, it does not work right".'[47] Bettelheim cites Joey's case history as a cautionary tale of man losing his perspective as *homo faber*. Joey's attitude to the machine is a rorschach that reflects the anxieties of the modern era. For Jungk, the logic of vivisection—that is, the indifference to the body as the subject of an experiment—culminates in science's attitude to the survivors of Hiroshima.

Jungk's *Children of the Ashes*[48] has to be contrasted with another major work on the same survivors, Robert Jay Lifton's *Death in Life*.[49] The Yale psychiatrist who published almost a decade later, studies the survivors within the matrix of relations between occupier and occupied, American and Japanese, white and yellow races. He locates the perception of survivor as patient primarily in his chapter entitled 'On Perceiving America'. Lifton embeds the survivors' perception of being 'guinea pig material' as part of the trauma of race and defeat. As a result, though the study is comprehensive in detail, the language and content of science as objectification eludes him. Jungk's ethnology is far more sensitive to the nuances of the dualism between research and healing, and to the notion of the patient as Taylorized spectacle submitting to the indifference of the clinical gaze.

The events described in Jungk's book centre round the establishment of a clinic by the Atom Bomb Casualty Commission (ABCC). The bombing of Hiroshima had brought, not a feeling of atonement, but a sense of opportunity. American scientists realized in their studies of radiation sickness the full possibilities of obtaining a Taylorized index of symptoms. Impressed by the pilot plant studies on radiation, the American defence secretary, James Forrestal, wrote a letter to Truman emphasizing 'this unique opportunity for learning the medical and biological effects of radiation', which 'would be of the highest significance for the US'.[50] As a result ABCC inaugurated a special clinic for the study of radiation damage.

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[47] Bruno Bettelheim, *The Empty Fortress* (New York: Free Press, 1969), p. 268.

[48] Jungk, *Children of the Ashes*.

[49] Robert Jay Lifton, *Death in Life* (Middlesex: Penguin Books, 1971).

[50] Jungk, *Children of the Ashes*, p. 241.

At first sight, the clinic was something out of a fairy-tale world. 'A patient would be examined for a whole day by the most outstanding specialists and in the most perfectly hygienic conditions. Indeed, the patient was even driven home and deposited at his own door without extra charge...For many of them—particularly women and children—this was often their first automobile ride.'[51] Closer scrutiny revealed that the fairy-tale clinic was a Taylorized scientific boudoir. What fascinates Jungk is the objectification endemic to the scientific act. In the case of Hiroshima it was further compounded by cultural dissonance. But Jungk is careful to differentiate between the two.

The atomic clinic was built, despite the protests of the mayor, at Hijayama Hill, a sanctified military cemetery. The ultra-modern style and elegance were a source of confusion to Japanese patients. Many skidded on their wooden sandals upon the polished floor. Signs on all doors were in English, and so patients were incapable of finding their way about. 'Many women would not dare go there without having first visited their hairdresser. Poor people such as casual labourers borrowed clothes from their neighbours in order to make a decent appearance.'[52] The Japanese were accustomed to being examined by a single doctor, but in the clinic they were treated like something on a factory belt, passed on from one specialist to another. 'The doctors would take specimens of their blood, semen, bone marrow, skin tissues. The patients would be thumped, have lights shone in their eyes, be photographed and pumped full of serum and none of the specialists ever explained why or with what purpose all this was done to them.'[53]

The scientific attitude added to this impersonality. The researchers imagined that, in a place where patients could get no medical treatment from their own doctors, they could simply examine 'interesting cases', and after establishing the fact that thousands of such cases were suffering from this or that agony, send them home without treatment or even hope of treatment. Jungk remarks: 'The atomic clinic became a greater source of hatred than the bomb itself.'[54] While many of the citizens could probably explain away the horror of the bombing itself as an act in war, they regarded the purely scientific activities of the ABCC as inexcusable.

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[51] Ibid., p. 240.

[52] Ibid., p. 267.

[53] Ibid., pp. 267–8.

Jungk's only comment on the cultural dissonance is his observation that Albert Schweitzer was often criticized for keeping his forest clinic in a primitive state, for refusing to equip it with the most modern technical devices. The experience of the ABCC with all its ultra-modern equipment shows that Schweitzer was right when he maintained that those who bring help to others must show by their behaviour that they approach in humility the people they bring help to.

But beyond the culture lag, what worries Jungk is the disjunction between research and healing.

> If a patient were ever to ask the scientist at the clinic, 'What do you advise, doctor? What can I do to get well again?' the doctor's reply was always the same, 'This is not a therapeutic establishment but a scientific institute founded in collaboration with the Japanese health authorities with the exclusive object of carrying out research.'[55]

Why was it that almost no scientist at the Hijayama clinic offered to heal or help a patient? The disjunction between research and healing has been explained at two levels. First, it is explained away as a political directive. Jungk remarks: 'American official policy from the very beginning up to the present day, has been adamant on one point. Any special treatment for the atom-bombed cities, any special treatment for bombed persons, has been absolutely denied.'[56] To do so would have been to admit to a war crime. 'In some respects the radioactive rays disseminated by the bomb could practically be equated with the effects of poison gas.'[57] It could thus be read as a contravention of international law and as a war crime. It was this mark of Cain that America refused to bear.

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[54] Ibid., p. 244.
[55] Ibid., p. 240.
[56] Ibid., p. 271.
[57] Ibid.

At the second level of explanation, Jungk suggests that the official dismissal of atonement compounds the vivisectionist paradigm of science. Modern science saw within radiation-sickness a territory where symptoms could be studied in a Taylorized form. Jungk admits that some individual scientists objected and personally attempted to treat patients. Such efforts were treated as emotional outbursts, and some of the doctors were forced to submit to psychiatric care. Even the 'human relations' techniques merely mask the subservience to the Taylorized world. When public hostility to ABCC became intensive, some scientists recommended the treatment of patients. But their letters ran as follows: 'With an increased effort to study more patients more thoroughly, and judiciously offer them therapy, there should be a marked increase in the rapport between the families and the ABCC. Then in the eventuality of death, it would be more possible to have worthwhile autopsies.' The clinic at Hijayama Hill did maintain a ten-bed diagnostic ward but it only dealt with interesting cases. 'It was a corpse production factory, to facilitate better experimentation.'[58] The industrial attitude to death is awesome. In vivisection, death and disease are merely obsolescence to be studied experimentally. The vivisectionist act denies the pain of the survivor in the search for meaning and thus precludes the possibility of sacrifice.

Jungk's sense of the tragedy of liberalism is like that of Greek tragedy. He argues that the power of liberalism encodes a fatal flaw. He refers in particular to the liberal commitment to technological progress. But instead of resorting to the metaphors of Greek tragedy, Jungk explains it in the current archetypes of the technological imagination. For Jungk it is America as concept, as utopia, that has dominated current mythology. As a secular myth it has exercised a powerful fascination. America is the new world, the country without a past; it is the frontier, the land of endless opportunity; it is the technological civilization as the perpetual-motion machine. In *Tomorrow Is Already Here*,[59] he explores the contradictions between liberal democracy and the liberal commitment to technological progress. Had Alexis Tocqueville become a science correspondent, he would have written such a book.

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[58] Ibid., p. 273.
[59] Jungk, *Tomorrow Is Already Here* (London: Rupert Hart-Davis, 1954).

Jungk differentiates between the two variants of the myth of America as a frontier. The first is the classic myth of the old frontier glorified in the writings of Frederick Jackson Turner; the second is the myth of science encoded as a bureaucratic text in science-policy documents such as in Vannevar Bush's *Science, the Last Frontier*. Both frontier myths serve to differentiate Europe and America as cultural categories.

Turner argued that nineteenth-century America was not a patchwork of European traits but something unique. What made America different was the presence of the frontier; vast stretches of land symbolizing unlimited opportunity and an absence of rules. The frontier stripped the European migrant of his cultural baggage and endowed him with essentially American traits of strength, inventiveness and restless energy. It was the frontier which created American democracy and individualism. Yet, Jungk observes, the frontier, which both as myth and history shaped the American imagination, carried within it the seeds of tyranny. 'Looked at historically, the tendency away from freedom seems to spring from the same source which yesterday and the day before watered the tree of American liberty, that is, the constant striving to open up new domains, the constant pressure towards new boundaries.'[60]

The nature of violence encoded in each myth needs to be elaborated. America was a society born in genocidal violence. Yet, the structure of violence in the old frontier was still Promethean, of an individual struggling against great odds. It was the violence of colonization and anomie. It was violence towards the Other, which rendered the human bestial, animal or savage enabling it to be encompassed into the notion of wilderness and conquered.

The structure of science as the new frontier, on the other hand, is hegemony of a different order: 'The battlegrounds of the new frontier lie in the science laboratories and workshops. It aspires not to ownership of land or conquest of any class or race.' It seeks, instead, the total domination of man over nature 'to recreate and

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[60] Ibid., p. 15.

organize a man-made cosmos, according to man-made laws... It destroys whatever is primitive, whatever grows in disordered profusion or evolves through a patient mutation ... nothing is left untouched, nothing unexplored.'[61]

The old frontier vision of creative violence is inadequate to understand the new genre of scientific violence. While the violence of the old frontier was softened by Christian and humanist values, the violence of vivisectionist science is indifferent to context. The frontier was physical space, and thus subject to physical limits, to closure. But vivisectionist science is a perpetual machine which creates continuous spaces through erasure and obsolescence. Science as the technological frontier is indifferent to both nature and culture. Nature appears a flawed machine; and culture, a mechanical artefact. The old frontier emphasized individual control, but now the individualism of the pioneer gives way to organized omnipotence. The new pioneer's individual impotence is the price for collective omnipotence. In the iconography of the old western, the gun was still an extension of the man's body. But in the new regime the body is an unstable factor to be replaced by a more reliable machine. Jungk observes:

> Never before has the human species been subjected to such systematic tests as in the laboratories of American aviation medicine. Here weak flesh is valued only as material. It is examined as objectively and pitilessly as a textile fibre, as a metal alloy. They ask: what pressure can the lungs bear? ...When does fear overcome spiritual and moral resistance? None of these things shall be left to chance. They even measure pain with the newly developed unit 'dolor'. They set up an equation for death by freezing, stake out a zone between consciousness and unconsciousness with a stop-watch.[62]

This text could easily have been transposed to the industrial research laboratories of Auschwitz and Buchenwald. Death in the old frontier was still a personal encounter; it now yields to vivisectionist indifference, reflected in the bombing of Hiroshima.

Jungk believes that the new frontier also mediates the western categories of America and Europe. The America of technical omnipotence embraces both USA and Russia and differs from Europe. America, to Jungk, is Europe minus its humanism. One represents amnesiacal obsolescence, the other humanist memory. The question Jungk then asks is whether Europe can redeem America, restore to the frontier the values it has discarded in the drive towards technological progress. Can one offer the revived communitas of Gottingen to the company town of Los Alamos? The return to Europe is inevitable. *The Big Machine*[63] is an evaluation of such an exercise.

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[61] Ibid., p. 17.
[62] Ibid., p. 63.

IV

Mushrooming spontaneously across post-war Europe was the collective dream of an international science embodied in the internationalism of a laboratory, a belief 'that the Dutch, Swiss, French, Scandinavians, Italians, Germans, Belgians, British, could build something together, something that could belong to all of them'.[64] As a consequence, they built in Geneva a high-energy physics laboratory, CERN, one of the great research centres of the modern world. CERN was to epitomize the internationalism of pure science. Its originators believed that pure science, to remain pure, must be delinked from technology. As an official explained, 'Atomic and hydrogen bombs have absolutely no place in the work done at CERN.' Bombs were gadgets, war toys peripheral to science, whose frontiers now lay, not in weapons laboratories, but in the high-energy physics centres at Brookhaven, Dubna and CERN. 'It was here that the family of nuclear physics scattered by politics was once again united.'[65]

The Big Machine is the story of the political, technical and organizational problems which arose in the construction of the giant particle accelerator at CERN, and the realization that a retreat to a simpler past, the Cavendish of Rutherford, was impossible. Rutherford's entire apparatus is still reverently kept in a small glass case at Cambridge. 'In his time, a few volts were adequate for the investigation of particles. Today research into the nucleus involves the mobilization of a few billion volts.'[66] Almost prophetically, the machine becomes the real hero of the book. The scientists appear at best as managers of a craft aristocracy in a special totemic relation to it. Jungk describes it with a tender awe: 'There it was below me: the horizontal ferris wheel almost one-third of a mile around, its spokes each more than a hundred yards long ... seen from the air the structure reminded one of an excavation site of ancient ruins'[67]— a modern Stonehenge. Jungk appears to both domesticate and theologize the machine. It is like a huge hearth around which an occult fraternity gathers, watching the accelerator plot 'the exciting ballet of the birth, death and transfiguration of elementary particles'.[68]

In the preponderant image of the book, the building of the great cathedrals of Europe, each particle event is an etched stained-glass window, an icon to a strange and baffling god. The making of the machine has all the air of a cultic revival, a mimetic act attempting to relive and recreate a lost cosmos, a community that scorned power. It is a return to the Round Table. The interplay of medieval archetypes marks the book: of the scientist as jousting knight, the gadgeteer as crafty peasant-technologist-troll who has seduced the good knight from his pure science chivalry. We hear of a return to 'higher forms of combat'.[69]

Jungk himself wishes that science would somehow salvage itself. The 'muck-raking' toughness disappears in the first pages of the book, where art almost turns into artifice, where this seasoned journalist resolves to return almost childlike to this reconstructed world of picture-book physics, where the structure of elementary particles is explained in metaphors of cheese and raisins, explanations that make science more edible. Jungk celebrates the non-bureaucratic nature of CERN, the fact that no passes were required

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[63] Jungk, *The Big Machine* (London: André Deutsch, 1969).
[64] Ibid., p. 27.
[65] Ibid., p. 4.
[66] Ibid., p. 14.
[67] Ibid., p. 18.
[68] Ibid., p. 24.
[69] Ibid., p. 183.

to enter it; the uniformed guard barely examined his credentials when he entered, a far cry from the company town called Los Alamos. Science, he feels, has once again become the esperanto of the resurgent international order.

The location of the laboratory was itself symbolic of a return to an Athenian dream. What especially enthuses Jungk is that, for the first time, issues were systematically discussed at the grass-roots level and not decided behind closed doors and imposed from above. Science was 'brought before the voting public for open discussion and decision',[70] 'something that had not occurred since the days of Athens'.[71] For several weeks Geneva became one large lecture hall. Physicists, psychologists, clergymen and political scientists spoke in convention halls and gymnasiums on scientific issues, which until then had never been discussed in such depth and before so wide an audience.[72]

The network of communication between the great high-energy physics laboratories at CERN, Brookhaven and even Dubna revives memories of the links between the gentle fiefdoms of early physics—Cavendish, Denmark and Gottingen. The co-operation between CERN and Brookhaven was particularly remarkable as they were basically rivals. Yet, the competitive complementarity between the greatest high-energy physics laboratories became a model in which militarized science yielded to the more agonal spirit of play. Pure science as a play form acquired an almost sacred quality, an aesthetic search bordering on the mystical, unravelling an atomic domain 'where a hundredth of an inch is as large as a continent and a second lasts a century'.[73] Jungk cites the instance of one of the scientists explaining:

> Suppose our civilization were destroyed in the atomic war and rediscovered centuries later by the descendants of a few survivors, what would they think this was, this gigantic circular structure precise to the thousandth of an inch. Most probably it would be taken as a place of worship. Please don't laugh at this idea. For I now ask myself in all seriousness whether what goes on at CERN cannot be considered a kind of worship in the language of the so-called scientific age.[74]

The scientist sees research as prayer, the big machine as an equivalent of the cathedrals of Europe, the workers like medieval craftsmen working in anonymity, and devoted to the creation of the new cathedrals of the scientific era.

The model of CERN, as Jungk shows, has relevance for science in the post-industrial age. The question that has been asked by philosophers and economists is whether science can be delinked from the production process and function once again as an aesthetic pursuit, a cultural act, a platonic search embodying the good, the true and the beautiful. Jungk cites as an example an essay by the British philosopher, Stephen Toulmin.

Toulmin observes that, as an occupational category, manufacture would involve only a minority of the population in a post-industrial society. The problem, as Keynes had anticipated in the *Economic Possibilities for Our Grandchildren*, would no longer be production but meaningful employment. Toulmin suggests that pursuit of science could be one of the meaningful tertiary occupations. He visualizes a series of such research towns where people would engage in the pursuit of research as an aesthetic or creative activity. Toulmin claims that such a laboratory would be as characteristic a feature of the late twentieth century as the mill towns were of the mid-nineteenth. The mind's eye is enraptured by the picture of a scientific Las Vegas.

Jungk is enamoured of the possibility. But the journalistic toughness in him reasserts itself in his doubts, more concretely about the experiments at CERN. Romanticism and scepticism combine in this strangely Jekyll-and-Hyde portrait of the Big Machine. The problem that worries Jungk is whether the attempt embodies a real striving towards truth or towards the construction of an effective mass image of a more humanistic science. He acknowledges that many scientists honestly believed that they could exorcise the demonic connotations of the term 'atom', that the atom for peace was distinct from the atom for war, that high-energy physics was a search for knowledge and not power, and public knowledge at that. The location of the laboratory in Switzerland was symbolic of this concern. Yet the return to innocence seemed facile.

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[70] Ibid., p. 60.

[71] Ibid., p. 61.

[72] Ibid.

[73] Jungk, *Children of the Ashes*, p. 8.

[74] Ibid., p. 19.

It was Niels Bohr who expressed this doubt. Critical of the debate on the proposals, Bohr and his circle felt that the proposals were grandiose and presumptuous, and warned that the university style of research would be lost in this research megalopolis. Bohr's circle discerned in it 'an expression of that hubris that since Hiroshima had possessed some of the scientists in the spotlight of attention'.[75]

Bohr's fears were not baseless. Jungk recounts a conversation with one of the makers of CERN who naturally wished to remain anonymous. The scientist remarked:

> What was the general feeling towards science in the years after the war? Politicians and economists had learned from experience that work in the natural sciences, even when it seemed far out and abstruse, could under certain conditions have revolutionary practical implications. This was particularly true of a field called atomic research. Therefore they hoped that nuclear physics would sooner or later produce something tangible for them, just as atomic physics had earlier. A super source of power perhaps, or a super weapon. In any event, one had to keep up with this undertaking in order not to be left behind again. We did not especially encourage this widespread speculation among laymen in high political positions nor did we especially discourage it either, for we knew it would serve our purpose intimately.[76]

Jungk wonders whether the ethical foundations of science are not affected, in the long run, through these acts of impression management. He also adds elsewhere that the democratic concerns of CERN were *post hoc*. Initially, the scientists reacted to the prospects of referendum on science as an annoyance but read back the acclamation as a celebration of the democratization of science.

Jungk's discomfort with the new research towns stems from his commitment to the university as the embodiment of the liberal dream. The university was both an urban and an urbane order, and science as a model of civitas was a constituent part of the modern university. The university as an institution represented the finest balance that knowledge as a system had achieved in western society. It reflected both classical continuity and modernist innovation. It captured both the tumult and the music of knowledge, its ritual grace and its raucous notes of dissent. The politicization of nuclear physics disrupted the institutional rhythm of the university.

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[75] Ibid., p. 46.

[76] Ibid., p. 47.

This process of subversion devalued the autonomy of the university as a liberal axiom. American scientists campaigning for civilian control of atomic energy in the post-war era were confronted with the ironic fact that the US defence forces had become the major financiers of scientific research in the university. Even more discomforting is the scientists' attitude. Philip Morrison, aware that defence funding of some schools constituted 90 per cent of their budget, reflected:

> The physicist knows that the situation is a wrong and dangerous one. He is impelled to go along because he really needs the money. It is not only that the war has taught him how a well-supported effort can greatly increase his effectiveness... There is a real need for large machines—nuclear chain reactors and the many cyclo-, synchro-and beta-trons to do the work of the future. He needs support beyond the capability of the university. If ONR or the new army equivalent G-6 comes with a nice contract, he would be more than human to refuse.[77]

Universities, once the home of free speech and dissent throughout the western world, are now parties to secrecy, willingly subservient to the militarization of research in contemporary society. Complementing the infiltration of the passive university was the creation of think-tanks, epitomizing knowledge for the marketplace, with the military and giant corporations as the amoral bidders. Not content with creating this breed of highly advertised intellectual harlots, the state made assurance doubly sure by establishing research towns like Los Alamos. If the university embodied the openness of science, the company towns represented the location of scientific activity in a total institution.

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[77] Jungk, *Brighter Than a Thousand Suns*, p. 230.

At first sight, the appearance of these towns is deceptive. Their antiseptic affluence hides their totalitarian intent; their suburban comfort, the banalization of evil in modern society. 'Walking through its main street, with artificially watered lawns ... in front of standardized houses painted in bright Easter egg colours,' Jungk notices children playing a new variant of hopscotch with squares marked radioactive and uncontaminated.[78] Los Alamos is advertised as a virtuous, high IQ town with no one either idle or unemployed. Jungk remarks:

> It would not need all these superlatives to show me that Los Alamos is a quite exceptional place. Actually this walled settlement on a plateau three thousand feet high should not be called a town at all. For any town must have some proportion of freedom in order to be able to develop and live, even to be able to die. But the collection of houses and workshops on the hill above the Rio Grande is an artificial and arbitrary product. It will never be acquired and the whole population is looked upon as transient. If a man gives up his job, if he is discharged or pensioned, he must give up his house which belongs to the government and leave Los Alamos.[79]

For this reason, one never sees old people here, except a few indispensable scientific pundits. The children will have to leave once they reach working age. They can remain only if they find a job here after passing security department's personality and aptitude tests. 'There is no staying on in the town where they are born and reared.'[80]

Los Alamos represents the final resolution of liberal science. For liberalism, the private was sacred and the public was open and accessible. In a bizarre inversion, vivisectionist science has opened up the privacy of body and soul to the public scrutiny of the clinical gaze, while science as public knowledge has become increasingly secret and forced into the most monstrous of total institutions—the research cities of the twentieth century. One is left with a deep suspicion that the transition from the university to the company town was effected not on grounds of efficiency but for reasons of state. The company town facilitated external control of scientific research.

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[78] Jungk, *Tomorrow Is Already Here*, p. 105.

[79] Ibid., p. 104.

[80] Ibid., p. 105.

V

Eric Kahler, in *The Tower and the Abyss*,[81] points to the etymological intimacy between the words atom and individual. According to Kahler, Cicero introduced the word *individuum* as a translation of the Greek word *atomon*, when he wished to expound the theories of Democritus. The two words are synonymous, both meaning indivisible. Today, the atom has been split and the integrity of the individual undermined through processes of which science forms an integral part. Robert Jungk's *The Atom Staat*[82] is an exploration of this etymologically rooted irony.

The atom staat is the nation-state as company town. It reflects the violence of a double hegemony. Science as expertise refines and validates the state as power, and the state ensures and extends the conditions for the production and reproduction of scientific discourse. Both tend to emphasize the powerlessness of the individual, who must surrender to the tutelary expertise of the modern state. The atom staat is the final technocracy and marks the eventual reification of the machine as metaphor. It is also the embodiment of one of man's grandest dreams, the search for the perpetual-motion machine. Within an occult vision, it might have embodied hidden meanings symbolizing notions of mystery, of limits, of humanity participating in the divine. The language of modern science has, however, reified it into a secular unmetaphorical pursuit. The machine as an esoteric code, instead of leading to an understanding of limits, becomes tied to unrestricted desire. The machine as a mode of thought is incapable of encompassing growth, death, history or plurality. Its vivisectionist power lies in conquest through duplication. It embodies the hegemony of a captive text, doubly violent because it is unable to liberate itself.

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[81] Eric Kahler, *The Tower and the Abyss* (London: Jonathan Cape, 1958).

[82] Jungk, *The Atom Staat* (The New Tyranny) (New York: Warner Books, 1979).

In *The Atom Staat*, Jungk unravels the structure of the double bind at the core of the nuclear regime. Implicit in the notion of the atom staat is a bounded rationality which cannot allow for the irrationalities of the fallible or dissenting man. As a mode of production, it demands a fail-safe system of security to avoid sabotage, and superhuman precision and accuracy to avoid accidents through human error. Yet man, fallible man, careless, forgetful, subject to fatigue and day-dreaming, forms a crucial part of this man-machine system at every stage of the product cycle, from mining and storage to waste disposal. The structure of the double bind arises from the above situation.

> The plain fact is that nuclear energy demands that man be made safe from himself—his mistakes, his weaknesses, his rages, his cunning and his lust for power. Protect nuclear energy from these foibles and you run the risk of a regimented society that would appear tolerable only in contrast to the dangers it seeks to avoid.[83]

The logic of the double bind and its accompanying violence can be plotted by locating the atom staat as text within the problem of management theory.

Production efficiency demands clock-time predictability which denies body rhythms. Scientific managers since Winslow Taylor have analytically broken down the body into a set of mechanical motions to improve it. Time-and-motion studies are an attempt to encode clock-time into body-time. However, the human body being a reluctant machine, it creates difficulties for the atom staat as a paradigmatic managerial system. In response the atom staat evolves two procedures: the displacement of man through automation, and the mechanization of man himself where he is considered replaceable. It is this that impinges on the rights of the individual. It seeks to standardize him as machine; and when it can't, it seeks to use him as a mechanically disposable part. Thus all the people beyond the pale of labour commitment thesis (the third world of inmates from old peoples' homes as in Germany, 'unemployed blacks taken right off the street' as in USA, students looking for holiday jobs as in France, or ordinary seasonal workers closer home) are used for the most dangerous jobs, exposed to radiation hazards far beyond permissible limits. This radiation fodder, instead of the skilled employees, is sent into contaminated areas to do preliminary work 'such as closing leaks, setting up entry locks around the leaks, and putting contaminated clothing and radioactive waste into plastic bags for disposal'.[84]

Simultaneously, those officially designated as workers are forced to submit to a battery of psychometric tests. Refusal to submit to the questionnaires spells unemployment. In their obsession with fail-safe security, employment agencies have begun systematic enquiries into the private lives and political associations of recruits. Other personal policies have also undermined the cherished humanism of the human relations school of industrial sociology. Scholars have emphasized the importance of informal relations and rituals of resistance in sustaining communitas in a formal industrial regime. Outstanding among these is the buddy system: in situations of danger, workers generally work in pairs to sustain, guard and rescue each other in case of accident. In the plutonium economy, industrial workers in sensitive areas follow 'the two-man rule' in order to maintain a mutual vigil. Rituals of resistance, such as gold-bricking, are the stuff of industrial sociology. Small collective subversions of the official rule spelt a touch of communitas humanizing an otherwise formal regimen. In a nuclear industry such violations of rules, instead of relieving tension, can spell disaster. Sneaking a smoke where it is prohibited, nipping in a bottle of beer where it is banned, fiddling with the pen-shaped radiation counter that each worker has to wear, rather than being a celebration of worker resistance, can be a death warrant.

Conditions of employment in the plutonium industry constitute one of the most systematic inroads into trade union rights. The right to strike has severe limitations because a nuclear plant, unlike an ordinary industry, cannot shut down: 'Physical processes are at work all the time and cannot be stopped without dire consequences. For example, highly toxic elements that could be dangerous both to the plant and to the surrounding countryside could be released if the cooling system were switched off or some of the equipment run at reduced capacity.'[85] Workers at the La Hague plant in France had to suspend their strike for such reasons. In the frightening prospect of their refusal to work, military intervention would have been necessary, leading to authoritarian reprisal against a genuine strike.

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[83] Ibid., p. 10.

[84] Ibid., p. 27.

The violence of the state against its citizens acquires even wider dimensions. Jungk's picture of the atom staat as a mode of occidental despotism deserves detailed scrutiny. Its structure of violence can be understood by opposing it to that other fascinating ideal type elaborated in social science writings from Marx to Wittfogel, the notion of oriental despotism. The authoritarianism of both stem from the control of energy. But the structure of violence encoded in each is radically different. The hydraulic complex differs from the plutonium economy in three distinct ways. It counterpoises localized authoritarianism to generalized hegemony; inhuman cruelty to impersonal terror; and, finally, the instruments of violence and the organizations for it have been far more systematically refined in occidental regimes.

The cruelty of oriental regimes is concrete and more personal. It is local and identifiable. While it tortures the other, it does not deny the other's humanity. It is inhumanly human. Cruelty might involve the maiming and torture of the body; yet, even as decapitation, branding, amputation or whipping, it has a quality of ritual control and spectacle about it. The structure of violence in occidental regimes is impersonal. Its terror is somehow abstract, its potential for coercion more frightening than the act of violence itself. Its impersonal efficiency makes the victim even more defenceless, since it rationalizes terror to the point of abstraction and indifference. But it is the scientization of the instruments of violence and torture that constitutes the unique violence of the atom staat. For example, the concentration camp as research laboratory sought to refine and scientize the means of inflicting pain and death, even industrializing it as genocide. Violence once viewed as pathological has become normalized in the structure of the atom staat, enshrining an Eichmann in every bureaucrat.

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[85] Ibid., p. 34.

The modern state, says Jungk, has used every opportunity to refine its means of terror and suppression. Jungk warns in particular against linkages between authoritarian nuclear technology and psychiatry. Among the new innovations of the scientific state he cites:

1. The use of CNC (Chloracetonphenon), a personality-changing gas, against demonstrators at the Gossgen nuclear plant on 3 July 1977.

2. Ultrasonic devices 'whose barely audible sound wave causes a loss of balance among those at whom it is directed'. It was used for the first time to successfully clear an occupied university building at Birmingham.

3. The teaser, 'a gun that fires two barbs attached to thin wires into a victim's clothing or skin. A powerful electronic current triggers immediate unconsciousness.'[86]

The violence of the atom staat against its citizens has blurred the distinction between internal violence and external threat, each being willingly used as an opportunity to develop the other. The wars in Vietnam and Northern Ireland have been used as opportunities 'to test on living subjects new ways of combating insurgents, saboteurs, urban guerillas and demonstrators'.[87] The spin-offs are a whole range of weapons, the chief beneficiaries of which have been the police and security agencies. Jungk warns that this internal arming of the liberal West has led to the creation of a police-industrial complex to rival and complement the military-industrial complex. The very growth of these structures undermines the ideals of human rights enshrined in liberal-democratic constitutions.

The atom staat also defines the violence of its inverted Other. The criminal state and the criminal violence of the guerilla terrorist meet in escalated mutuality. The guerilla is the symbiotic Other whom the atom staat requires. It invests him with contrary properties. Nuclear technology is bureaucratic, predictable, centralized; guerilla terror is unpredictable, anarchic and idiosyncratic. The sanitized bureaucracy symbolizing order transfers to the guerilla the feeling of chaos. Terrorism then evokes fear of the destruction of order; the savage reappears as the guerilla, an animality threatening culture. For the atom staat, he represents the irrationality of the body. Yet Jungk's descriptions reveal the strange complementarity of the two orders. It is the presence of the guerilla that justifies both the intrusion of the scientific state into private domains, and escalating investments in total security.

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[86] Ibid., p. 184.
[87] Ibid., p. 191.

Guerilla terror becomes the rationale for the suppression of civil rights:

> Contingency plans for terrorist assaults in the atomic state call for the mobilization of the police and armed forces on a scale hitherto reserved only for outright revolution... Troops would undertake house-to-house searches without warrants in entire sections of the city. Detention would also be used as a step in a very troubling interrogation scheme, perhaps involving lie detectors or even torture. The normal deterrent to such practices—inadmissibility of such evidence in court—would be ineffective in a nuclear emergency.[88]

Jungk cites a number of legal conferences which attested to the legitimacy of such measures in an emergency. He does not deny the importance of quick and concerted action, but warns that security agencies seeking to reinforce their control might acquire a vested interest in terror. History has shown that firemen often start fires to consolidate their own expertise. The history of Europe in the nineteenth century reveals that the police often obstructed workers' movements by inciting terrorist attacks against royalty.

Jungk warns against the danger of perpetuating a state of emergency:

> In time, laws designed to deal with a crisis—such as an outbreak of terrorism—will become a norm for what is in fact a permanent state of crisis. The watchword will be: Protect at all costs the source of energy. Atomic power continually under threat leads to a permanent state of siege. It brings about harsh new laws to 'protect the people'. It encourages denunciation of atomic energy opponents and environmentalists as a 'precautionary measure'. In the end, it will justify everything from the mobilization of thousands of policemen against demonstrators to the body search of all those arrested simply for exercising their rights as citizens.[89]

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[88] Ibid., p. 170.

[89] Ibid., p. 190.

The state finds in nuclear energy an unfailing excuse: to protect nuclear power it continuously extends and consolidates its own. The atom staat becomes an institutionalized Watergate or, in more local comparison, a continuous Emergency that justifies the state's dirty tricks against its own citizens. This is the crucial part of Jungk's thesis, the vital argument as to why the atom staat is impermissible. The 'sacred complex' of nuclear energy constitutes the most powerful legitimation 'for the abrogation of civil rights in modern society'. Jungk's essay reads like a passionate Amnesty International report of civil rights violation in a plutonium economy.

Jungk's arguments must be located within the context of contemporary political theory. The history of the cold war has primarily determined the logic of these scripts. To the liberal mind, the crisis of Marxism lay in the travesty of science called Lysenkoism and in the long history of the Soviet gulags. Similarly, fascism was devalued for its parochial caricature of physics as a Jewish science. The influx of Jewish émigré scientists to the liberal world confirmed it as the most hospitable matrix for science as universal truth. Today, as Jungk shows, the crisis of democratic liberalism lies in its use of science to justify violence against its own citizens. Nuclear 'parks' may soon be the equivalent of gulags for the liberal West.

The similarities are disconcerting. Communist violence, as Merleau-Ponty observes,[90] was justified in terms of the objectivity of revolutionary truth. Violence was the birth pang of the proletariat. The mechanical vulgarity of Marxists lay in their inability to appraise communism critically through Marxist spectacles. Those who did were labelled subversive or reactionary, while in fact they constituted the most creative component of Marxism. There is a similar loss of dialectic, a similar submission to the 'dictatorship of truth' in the atom staat. Violence to man is once again justified within a theory of objective scientific truth. The totalitarianism of nuclear regimes is validated as scientifically necessary, and dissenters are labelled reactionary or unscientific. Jungk's book is thus a study of the gap between the projection of science as a model of freedom and its sociological refutation in the atom staat.

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[90] Maurice Merleau-Ponty, *Humanism and Terror* (Boston: Beacon Press, 1969).

Jungk outlines a set of strategies to combat the hegemony of the atom staat. First, he emphasizes the importance of adopting dissenting scientists as prisoners of conscience. The significance of this stand must be emphasized. Unlike many counter-culture movements which reject science altogether, or radical scientists who feel it is only the socially conscious scientists who can save the world, Jungk insists on the plurality of the critical encounter. Secondly, he emphasizes the necessity of a creative science deconstructing the hegemony of the scientific state, not with a view to denying science but redeeming it. Thirdly, he asks for full scope to be given to the creative urge of every man to become his own scientist. Finally, he pleads for the coming together of scientists in a creative search for alternatives. Jungk does not underestimate the sacrifice that a high-energy consumerist society must make to renounce the atom staat. But with these measures modern science, as apocalypse, while bearing intimations of the end of western civilization, may also be bearing its dialectical opposite: the seeds of a more human theory of technological choice. We shall now explore each of the strategies proposed by Jungk.

VI

One of the most disturbing of Jungk's revelations is what the atom staat does to its dissenting scientists. Like the robber barons of the earlier industries, the atom staat is ruthless in dealing with those who oppose it. Jungk cites the case of Karen Silkwood.

Karen Silkwood, a 28-year-old employee at the Cimmarion plutonium plant, was appalled at the safety conditions at her workplace. She discovered that, between 1970 and 1974, eighty-seven employees had been contaminated by plutonium in twenty-four separate incidents. She initially filed a complaint at the union headquarters in Washington. Sent back to gather conclusive evidence, she found that the company was falsifying laboratory reports and X-ray photographs relating to these incidents. On 13 November 1974, she died in a car accident while on her way to meet her union representative and a *New York Times* reporter. Needless

to say, the concerned files disappeared from her car. There was no attempt to question the visit of company officials to the garage in which the car was kept immediately after the accident, or to follow up the collision expert's report containing evidence that her car was rammed from the back. Instead, all employees at the plant were forced to submit to lie detector tests about their union activities and their conversations with Silkwood. Those who refused to comply with such an enquiry were either dismissed or transferred to harder jobs.

The Silkwood case is only one of a series of instances that Jungk cites to show the reactions of the atom staat to its experts in opposition. Its rituals of segregation and control include studied silence, threat, derision, slander, ostracism, dismissal, blacklisting and murder. It is in this context that Jungk proposes that a special fund be provided to fight civil rights cases *vis-a-vis* the science establishment. Jungk says: 'There must be many scientists who want to tell what they know, but fear disgrace and the financial hardship of being fired... Such a fund might encourage the scientists who in the past covertly passed information about the conditions that bothered them to finally come out in the open.'[91] Jungk realizes that this opposition must be more than a series of eclectic or contingent responses. To constitute a dissenting academy such a movement must attempt to deconstruct science as disembodied knowledge and restore to it its historicity.

Science today appears as disembodied knowledge, and research as mechanically produced truth indifferent to biography, history or culture. This reification of scientific knowledge is etched clearly in an exquisite essay by Roland Barthes.[92] He argues that 'Einstein's brain is a mythical object; paradoxically the greatest intelligence of all provides an image of the most up to date machine, the man who is too powerful is removed from psychology and introduced into the world of robots'.[93] Einstein's researches appear as a mechanical act. He produces truth the way other machines produce sausages or grind flour. Barthes adds that Einstein himself contributed to this myth by donating his brain for medical research. Two hospitals are still fighting for it 'as if it were an unusual piece of machinery which it will be possible to dismantle'. The scientific method has become a disembodied mechanical programme producing predictable truths which can be duplicated with clockwork regularity. Jungk insists that the first step in the deconstruction of science is to restore its historicity, for science to be read not as a mechanical research output but as the sociobiography of individual discovery. He asks, 'Why are we interested only in what scientists do, not what they are?'[94] The subtitle he gives his book on the bomb is 'The Personal History of the Atomic Scientists'.

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[91] Jungk, *The Atom Staat*, pp. 118–19.

[92] Roland Barthes, 'The Brain of Einstein', in *Mythologies* (St Albans: Paladin Books, 1972), pp. 68–70.

[93] Ibid., p. 69.

Science, Jungk says, is not only presented as disembodied knowledge, but also as something objective and detached—as expertise. This threatens in two ways the basic notion of the individual's ethical responsibility for his actions. First, the individual surrenders to the expert the right and responsibility for discovering and living out his own truth. Second, the expert himself feels no responsibility for his actions. Hannah Arendt's book on the trial of Eichmann reveals that Eichmann considered himself an expert following the logical consequence of his expertise on extermination. She also adds that Eichmann did not feel responsible because he considered himself a bureaucrat under orders to use his expertise. In a similar manner, Compton rationalized Oppenheimer's behaviour on the bombing of Hiroshima 'as a technical reply to a technical question'.[95]

Jungk's third step in deconstructing science is to question the very content of the expertise itself and thereby challenge the synonymity of expertise and truth. His texts for analysis include the American reports on nuclear safety and the scenarios of scientists at the International Institute of Applied Systems Analysis in Austria. The studies of Herman Kahn could also serve as an equivalent and more accessible datum.

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[94] Jungk, *Brighter Than a Thousand Suns*, p. 11.
[95] Ibid., p. 167.

The reactor safety study was commissioned by the US Atomic Energy Commission. Popularly known as the Rasmussen report after its director, its findings claimed that the likelihood of an accident in nuclear plants was extremely low. The report, says Jungk, is a classic example of an 'objective study'. A scrutiny of its methodology reveals that the Committee relied almost totally on material supplied by companies that built the reactors and therefore had a vested interest in the continuity of the nuclear industry. Norman Rasmussen himself was a well-paid consultant to the nuclear industry. The report also fails to make clear that the crucial question was not only the probability of an accident but the nature of the accident itself. An atomic disaster is not like a dam break or a gas leak. The effects of an atomic disaster might persist for several generations. The irony lies in the power of science. Its hold is so strong that ordinary men and even other scientists are lulled into believing the assurances of the objective expert.

Jungk sensitizes us to the language of this discourse. The language of nuclear catastrophe as apocalypse is marred by an inadequate vocabulary. The literature on plagues, famines, and floods has, each in its own way, contributed to the expansion of language, reflected cosmology, mediated between man and nature and the natural and the supernatural. They have added to the verbal quality of our deepest imaginings on pain, death and deformity. The 'scenarios' on nuclear catastrophe seem aridly secular. Denied the availability of both the sacred and the humanist vocabulary, they reflect the terminology of a bureaucratized science. The bureaucratic normality of the genocidal scenario, its clockwork predictability, the timetable of deaths, the extrapolated statistics, all hide the inability of science to talk meaningfully of death and genocide. So lacking in poetry is this futurology that it is forced to mimic the styles of Hollywood and Madison Avenue. This mimicry serves as an ersatz for the metaphors of the sacred, and also of humanism. The language of the scenarios is homologous to the machine. Science represents the disembodied mind, the scenario mirroring the disembodied future, and the computer programme provides the decisional calculus. Death and destruction sound woefully commonplace. Yet the structure of evil lies in this very banality. In the banality of bureaucratic science, genocide becomes an office memo and the census, a death warrant. The catastrophe of a nuclear future has the everyday quality of a railway timetable.

Jungk then questions even these scientists' basic claims to dispassionate objectivity. Wolf Hafele's advocacy of fast-breeder plutonium technology scares even such ardent supporters of nuclear energy as Edward Teller. The scientist has begun to wallow in his own power. To Hafele, the objection that such breeder technology is in its infancy is irrelevant. He sweeps aside the time-honoured practice of painstaking trial runs for new technical installations as irrelevant. According to Jungk, Hafele is not alone in these departures from one of the unwritten ground rules of technological innovation: repeated prior testing of a prototype. 'Today, new reactors are put into operation in densely populated areas without experimental knowledge about the unpredictable interplay between thousands of components which make up these gigantic systems. Computer simulations and game theory substitute for trial runs.'[96]

These scenarios function as the equivalent of verbal machines. Like Bettelheim's Joey, the scientist is plugged into these verbal machines. And these machines provide a substitute for the human encounter with danger, pain and error. It is not truth but images that one is concerned with; the necromantic fantasies of Kahn and Hafele masquerade as theories without experimental verification. Seen in this light, the scientist's belief in the objectivity of these simulations is truly remarkable. Again, it reminds one of Joey whose 'pantomime was so contagious that those who watched him seemed to suspend their own existence and become observers of another reality'.[97] Yet Jungk refuses to caricature these scientists. He shows that the problem lies in their expertise, that many are individuals with intelligence and sensitivity. The structure of their expertise, however, desensitizes them, draws them into 'objective acts' whose consequences are evil. It is this evil, this banal evil, that Jungk sensitizes us to.

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[96] Ibid., pp. 57–8.

[97] Bruno Bettelheim, *The Empty Fortress*, p. 235.

The deconstruction of scientific expertise as truth has its corollary: the emergence of the common man, not in the inverted Otherness of the savage, the guerilla or the obsolescent worker, but in the plural togetherness of the protest movements of the post-war era. Archetypically, the common man embodies the creative search for survival. In Jungk's work, the survivor first emerges in his study of Hiroshima. We had encountered him earlier as the object of vivisection, as an industrialized map of symptoms. We counterpoise to this objective grid the survivor's biography of pain as suffering, a celebratory search to extract meaning from the indifference of vivisection.

Within the genre of survivor literature, one can discern two roughly differentiated categories. The first, based on the Nazi camp and the Soviet gulags, is concerned with how individuals outlived the torture and suffering of these camps; the second, embodied in the studies of Hiroshima–Nagasaki, with how individuals lived out the fact of having survived the holocaust. A study of both, exploring similarities and differences, is contained in Lifton's classic, *Death in Life*.[98] We shall, however, concentrate on Jungk's reading of the survivor in Hiroshima. It emphasizes the particular nature of vivisection as catastrophe, as opposed to other catastrophes like plagues and natural disasters. Vivisection as a genocidal act denies meaning to both death and life. It is in this context that survival as sacrifice, as a search for meaning, becomes doubly poignant.

The survivor is an individual who has eluded death but carries the perpetual imprint of it. In him the notion of life cycle either as ordered biology or ritual cosmology is impaired, throwing him into a perpetual state of liminality. He cannot return to the living world because the memory of death is permanently with him. He cannot die because he now has to live as encapsulated memory, forever reminding life of the Thanatos within it. He thus carries a double burden: the guilt of having survived, and as the living memory of death which, in our amnesic way, we seek to forget, humanity's common guilt about all those who died so meaninglessly. The survivor is the wound in the body and yet he must also become its healer, as poet, philosopher and scientist. Jungk captures all this in his essay on two survivors, Kazuo M, eventually sentenced for murder, and the pacifist Ichiro Kawamoto.

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[98] Robert Jay Lifton, *Death in Life* (New York: Random House, 1967).

Kazuo M was fourteen when he witnessed the bombing of Hiroshima. While digging into the rubble that had been his parents' home, he found his old school book in a half-burned rucksack. It was a perfectly ordinary book, 'a reader issued to the middle schools, a book which at that time everybody in third form throughout the whole of Japan had to possess'.[99] When he found the book, he clutched it with joy as if he had encountered an old friend. It embodied many of his childhood memories for him, 'entire poems, proverbs, whose passages of prose... he knew by heart'.[100] It represented order for him, the geometrical clarity of the civilization, the world, all that he knew. However, the bombing of Hiroshima, the defeat of Japan, the death of his colleague pinned by a fish-tail splinter of glass, the experience of carrying the naked body of a school friend through the bombed streets, had shattered this world. At this moment he felt an overwhelming urge to execute the book, to shred every one of its pages into minute fragments so that nothing would remain legible.[101] As long as anything even remotely resembling the bombing 'that day could occur—could be allowed to occur—then all the beloved words of his reader could be nothing but lies. After that, what value could be attached to thought, to knowledge?'[102]

Jungk's study reveals that catastrophes can serve as equivalents of paradigm crises, because the weakness and practical consequences of a paradigm emerge with gestaltic clarity at such a moment. Kazuo M's act is a dramatic example of such a repudiation; but the problem, as Jungk shows, is the creation of a new gestalt providing meaning to the survivor's biography. Some of the cases he describes are virtually parables. I shall cite one (but removed from its context and therefore somewhat distorted). When Kazuo M eventually decides to murder a black-market operator, he ponders over the particular method of killing. He is reminded of a sensational trial of that time, known as the Tukoku Bank case:

> One day in January 1949, shortly before the bank closed for the night, a painter named Hirasawa had appeared disguised as an official of the Health Department and told the bank manager that he and his staff of fifteen must immediately drink some medicine which would act as a prophylactic against various epidemics then raging. He had brought the medicine with him. The treatment was, needless to say, at government expense. Since there were indeed epidemics rife at this time, sixteen persons immediately obeyed this order which seemed quite reasonable and swallowed the bitter draught. They had collapsed almost at once, whereupon the bank robber had calmly and quietly set about his real business.[103]

The Goffmanesque subversion of science in the above story recognizes the rules of the dominant order, and seeks to exploit it rather than change it. The ordinary survivor's search, however, marks a more difficult journey.

The survivor's search for a paradigm that imposes meaning on his 'death in life' is forced by two external factors, the indifference of vivisection itself, and the general urge to return to normalcy at any cost. Both deny the survivor's search to preserve memory and meaning.

Post-war Hiroshima was a furiously Americanizing city. It had become a tourist resort as an official peace city with commercial peace sales; and during the Korean war it also became a major centre of the armaments industry. This push to normalcy created a world in which the survivor felt he had no part. 'The houses and streets might be rebuilt, but they remained human ruins falling ever into decay with each day that passed.'[104] The illness of the survivor was either unrecognized or stigmatized. His complaints about bodily pain were interpreted as hypochondria, his memories of that day as neurosis. For a considerable time the suffering of the survivor was not even recognized as illness either in Japan or in America. When recognized as an atomic disease, it became a stigma, something to be hidden even from friends, relatives and doctors.

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[99] Jungk, *Children of the Ashes*, p. 17.
[100] Ibid., p. 17.
[101] Ibid., p. 22.
[102] Ibid.

[103] Ibid., p. 198.
[104] Ibid., 231.

Jungk's other story is about a man who acted to fill this breach—Ichiro Kawamoto. 'He did not demand scientific proof that they were suffering. He simply did what he could to help, without asking too many questions... He would take one a little boiled fish to eat, to another he would give a blanket, a third he would visit solely to encourage and divert him with his conversation.'[105]

The struggles of Kawamoto and his wife reveal the pain of the survivor and the sterility of a world threatened by nuclear war. The 'hibakusha'—the survivors—were afraid to love, afraid to procreate lest they should bring deformed babies into the world. This particular crisis of the survivor demands that we rethink the conventional liberal notions of the right to life and the pursuit of happiness. We have to broaden our concept of this right to include the right to one's ancestors, to the cosmological continuity of the past, to the ritual dignity of dying and the right to procreate an undeformed child as the future.

The survivors realized that ' "the self-destruction of humanity" which they had been compelled to witness at Hiroshima had not in fact begun with the explosion of the Atom bomb, but much earlier with its invention and creation'.[106] They understood that their experiences must give new meaning to their work through poems on everyday life. Every man became a poet and an artist in post-war Hiroshima: 'Hospital orderlies, patients, factory workers, in brief, human beings from every class of society began to write.'[107]

Jungk captures this era of sacrifice, the pain and the celebration of life with compassion. Each of us must recapture for ourselves because we are the survivors—everyone in the nuclear age is a survivor. We have to share the burden. Even as protestors against the atom staat, we join in the ritual acts of participation in the new body politic. It is in this context that Jungk analyses the protest movements of the sixties.

The protest movements against the bomb lack the monolithic certainty of nationalist and class struggles, crisscrossing across them in both celebration and confusion. Their very confusion signifies a potential for plurality, becoming literally a festival of protest embodying the new semiotics of the body.

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[105] Ibid., pp. 247–8.
[106] Ibid., p. 101.
[107] Ibid., p. 100.

The recoding of the new polity begins with the body as the grid for the calculus of suffering. It is the body that recodes the unrestricted individualism of the mechanical man, evolves certain criteria for thinking out certain tentative alternatives in science and technology. The recovered body mediates between nature and culture, rediscovers spontaneity and becomes the gross body and the intimate body of the 'sit-ins' and the new street theatre. It becomes the index of its own truth. When the pacifist 'sits in' on a hunger strike, suffers bodily as a protestor, he embodies his own truth. Only such a sacrifice can redeem the vivisected body. The body as ecology challenges the conventional rationality of economics, demanding that industry rethink its attitude to nature. It insists on a restriction of desire, a restructuring of one's basic needs away from consumerism, embodying a realization that natural resources must be conserved. Simultaneously, it challenges the excretory nature of modern technology, particularly of nuclear energy whose stored wastes may be dangerous to man for over 50,000 years. It complements the conventional categories of political economy—production, distribution and consumption—with the additional category of disposal.

Jungk remarks that the celebratory explosion of the sixties has not died down but has been harnessed into disciplined work. He is impressed in particular by the manner in which the protestor has become his own scientist rather than yield this right, by benign neglect, to some expert:

> It is impressive how these people from varied backgrounds will take the trouble to study the implications of nuclear power and master complicated and technical data. They weigh them critically and apply them to their own situations. They are more powerfully motivated to learn than the average citizen and quickly assimilate the new material. Often they come better prepared than do local politicians and representatives of industry. And they can no longer be brushed aside with slogans and weasel words...
>
> At such confrontations it is interesting to listen not only to what is said, but how it is said and to watch the faces of the participants. Invariably

> supporters of nuclear power plants present an image of casual restraint, boredom, aloofness, convoluted 'objectivity' and smug superiority with scarcely a trace of warmth or empathy. The faces of their opposition are lively and attentive, full of enthusiasm and spontaneity.[108]

The cultural construction of the recovered body has place for compassion and fraternity: 'The movement takes seriously the huge gap in the standards of living between the developed and the less developed nations.'[109] Rather than export its life-style or use food as a weapon in times of famine, by deciding who shall live or die through a scaling of suffering, the protestor in the affluent West is learning to restrict desire, practise a more modest life-style.

This model of survival challenges the triage 'ethics' of modern science, which admits inequalities of suffering rather than understands fraternities of compassion. Triage encounters rationality, not meaning. The decision to bomb Hiroshima was based on a scaling of suffering and death, the assumption that fewer American lives would be lost this way. The ethics of survival seeks to offer a wider ecological understanding, not just of the physical fact of survival, but the meaning of the act. What does one survive for? How should one survive? Such an ethics as the rationale for an alternative notion of science and technology is essential to save it from the sociobiologism which has entered the analysis of the concentration camp,[110] and the bounded management rationality of triage ethics. While choices cause pain, to reduce the calculus of suffering to techniques merely adds to the ultimately reductive power of positivist science.

Jungk also emphasizes that these acts of celebratory renunciation must be supplemented with creative research into other forms of energy derived from the sun, the wind, the tides and photosynthesis. A search for alternative energy sources constitutes realistic bases for alternative life-styles and eventually life chances. Yet Jungk is cautious: 'Despite these hopeful signs, it is still possible that the new tyranny will temporarily push the nonviolent new international movement into the catacombs.'[111] But if it prevails, the work of Jungk and others like him will be remembered as harbingers of this new imagination in histories and festschrifts. During these festivals of remembrance, I should like to take these five books of Jungk, more mellowed with time, and re-read them as fables of the gentle angry Aesop of a bygone nuclear age.

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[108] Jungk, *The Atom Staat*, pp. 204–5.

[109] Ibid., p. 206.

[110] Terrence Des Pres, *The Survivor* (New York: Oxford University Press, 1976).

[111] Jungk, *The Atom Staat*, p. 209.

The House of Bamboo

On 7 November 1995, Mizoram became the first Christian state in South Asia. Flying over the hurriedly improvised secretariat building was a new flag, a brown cross flanked by bamboo groves. A small band enthusiastically played a song, half carol, half anthem. Henry Sailo, the self-styled Brigadier General Henry Sailo, took the salute as the first president of the new republic.

I watched him sardonically. Henry Sailo was my old classmate from North Point, Darjeeling. North Point was a beautiful college which catered to Christian tribals, children of rich planters and richer people from Bihar, Assam and Bengal who couldn't hope to get admission at St Xavier's or Presidency. But the Jesuits were wonderful teachers and even made scholars of some of us.

Henry and I were both science students. He felt we maintained nature's balance: he, by being at the bottom of the class, me, by being at the top. Our Jesuit professors labelled him a rogue, a rascal and a ragamuffin, and he was proud of all three labels, wryly claiming he had mastered all the 3 Rs.

He had hardly been a year at college when he was dismissed, some say for drinking the chapel wine. That was the last I saw of him for years. His Mizo friends claimed that he had joined the underground. There were fragmentary reports in the newspapers about the Mizo National Front (MNF). *The Times of India* mouthing the official confusion dubbed him a 'Maoist' after his stint in China, and a bible toting gangster given his Christian background. Christian, Henry was, down to his alcoholic evangelical gills.

I am a Tamil brahmin. In another age, I would have been a pundit or a munshi. My tastes were literary but in this bureaucratic era, all brahmins become scientists or accountants. Being poor at Maths, I opted for Botany. After a Master's at Delhi, I joined the Botanical Service at Calcutta as Senior Scientific Assistant, Grade I. As luck would have it, I came under the protection of Y.V. Narayan Rao.

Y.V. was a brilliant scholar, polished and precise, a concerned man who felt that social responsibility should be distilled through scientific competence. He hated Calcutta, especially in the Naxalite years, claiming it was a reflection of romantic *babudom,* potential clerks playing at Che Guevara. Revolution by the Secretariat, he dubbed it. Tired of Calcutta, 'the terrible backwater', Rao was moved to the Assam centre of the service to begin his remarkable reports on bio-diversity.

For Rao, nature in India was a festival. He felt ecology was a political science and the political goal of ecology was to save agriculture as a way of life. 'Rice is not a way of life,' he said, 'It is life itself. And someone who does not understand rice, or the coconut, or the bamboo does not understand India.' He was horrified when the government opted for the Green Revolution strategy, insisting that research in Indian agriculture in the fifties was far more imaginative than anything the Rockefeller Foundation could dream of. He dismissed the current crop of scientists at the Indian Agricultural Research Institute (IARI) as 'Borlaug's boy scouts', a 'finishing school for third-rate Americans'. An intellectual redlight district, he called it once. But in the early seventies, people laughed at him and thought he was an eccentric. Confined to Assam, the Krishi Bhavan mandarins felt he would be a harmless dissenter.

Narayan Rao gave me my first fix as a researcher. He told me about the bamboo. 'Don't call it grass,' he ordered, 'Grass is an English governess's word for it.'

I was strangely depressed at studying the bamboo. I felt demoted. Rao insisted that I stick to it, screaming that there were no Balasaraswatis in science because everyone was looking towards America. It was his pet anger. He had this classification of successful Indian scientists into the Rukmini Arundales and the Balasaraswatis. The first were cold, correct and lifeless. The second breathed, brawled, improvised, invented. These were the earthy ones. M.S. Swaminathan (FRS) was an Arundale, C.V. Seshadri, the chemist, belonged with Balasaraswati.

The diversity of species fascinated Rao. 'Forty thousand varieties of rice,' he exclaimed. 'It shows that nature is not yet tired of man, at least not in India.' He insisted I read J.B.S. Haldane. 'Terrible man, but what a beautiful scientist. He saw connections between tusks and tails and seeds. Read him, read his essay on the peacock's tail. Nothing like it,' and Rao began reciting from it as if from a fragment of an epic.

When you live with an eccentric, some of his passion rubs on to you. You begin living out his dream. It is like living with a dog. Part of his dogginess rubs on to you. Wives notice it. I too began dreaming bamboo.

Paradoxically, the first book he gave me on the bamboo was Agnes Arber's *Grasses*. If you want to love botany, don't begin with the Germans or Americans. Germans sound like technical manuals and Americans, Americans are still learning to write, although the new ones soaked in ecology have a lovely turn of phrase. To write about grasses, you must love the countryside. Love, a magnifying glass and a pair of strong boots. The English botanists have all three, Agnes Arber in particular. So deceptively simple, yet she misses nothing and all with an ear for Shakespeare and an eye for Goethe.

I spent the next twenty years working on the bamboo. How does one describe it? It is exotic and yet so everyday.

It is the stuff of cookbooks. It is the poor man's water-pipe. It is furniture. It is handicrafts. It is exploitation, especially when it is sold at subsidized rates to those great devastators, the paper mills of India. It is cuisine but it is also cosmos. Economic botany splits this cosmos, merely listing its market uses. It is a plant with a strange secret that took years to map and is still to be deciphered, a tropical secret which the everydayness of the bamboo hid for years.

There are basically two kinds of bamboo. There is one kind of species which flowers and fruits annually. These species exist generally outside the Indo-Asian tropics. There is another bamboo, the carnivalesque bamboo, that is both the hero and the villain of this story. This bamboo does not flower annually. It 'masts synchronically', to use a scientific term. Scientists use the word masting to describe the 'synchronized production of seeds at long intervals by a population of plants'. Masting is a more accurate term but in colonial eras when language was true if not accurate, the word used was gregarious flowering. And that's what the bamboo does, flowers in carpets of hundreds and thousands of square miles. Today there is little concern with masting because science is done in laboratories without windows.

When it comes to such concerns give me the old colonial surveys any day. These reports might smell of Conrad and Corbett, of power and corruption, specially now when everything is viewed as orientalists' discourse. Slice the Christian mind of these scientists and you will find the tribal folktale. Their botany always had this sliver of anthropology. Today our scientists are more correct, as if this whiff of colonialism might destroy their scientific hygiene. They forget that when plants are dying across the world, folklore might be the only record left.

For the old colonials, the flowering of the bamboo was a miraculous event, recorded again and again. Few ever sought an explanation. Some studied it methodically. Yet the old records of the bamboo from Baker,[1] Blanford,[2] Blatter,[3] Bradley,[4] Brandis[5] and Bourdillon[6] make good reading. There are shades of this in the later writings of Father Santapu[7] and Chatterjee[8] but only in 1967 do we

[1] E.C.S. Baker, 'The Game Birds of India, Burma and Ceylon Part', *Journal of Bombay Natural History Society*, 1916, 24: 201–23.

[2] H.R. Blanford, 'Note on Operations in Bamboo Flowered Areas in Kartha Division', *Indian Forester*, 1948, 44: 550–60.

[3] E. Blatter, *The Flowering of the Bamboo* (Part I), *Journal of Bombay Natural History Society*, 1929, 33: 899–992.

[4] J.W. Bradley, 'Flowering of Kija Thaung Bamboo (Bambusa polymorpha) in Irome Division, Burma', *Indian Forester*, 1899, 25: 1–25.

[5] D. Brandis, 'Biological Notes on Indian Bamboos', *Indian Forester*, 1899, 25: 1–25.

[6] T.F. Bourdillon, 'Seeding of the Theory Bamboo', *Indian Forester*, 1895, 21: 228–9.

[7] H. Santapu, 'The Flowering of Strobilantnes', *Journal of Bombay Natural History Society*, 1944, 44: 605–6.

[8] D. Chatterjee, 'Bamboo fruits', *Journal of Bombay Natural History Society*, 1960, 57: 451–3.

get the first synoptic survey by Daniel Janzen.[9] There is anger in the report and even sadness because the huge flowering of the bamboo is becoming unique. Even Janzen is reduced to guesses because the natural habitats where the bamboo flowered synchronically are being destroyed across the world.

The first signs of trouble were mere rumours. Old women's gossip, conversations in weekly markets that said it was the year of the bamboo. No official in Aizwal or Delhi took the reports seriously. Officials, unlike shamans, don't understand the music of rumour. There was even a Sunday supplement story in a newspaper that laughed at fears of 'a new demon, half-rat, half-bird' that would threaten the Lushai, as silly MNF propaganda. I wonder if Delhi realized that Mizoram was among the most literate states of India, with the highest percentage of female rural literacy.

Only Y.V. was restless as a bird before the storm. It could be the year of the *mooli* bamboo (*Melocanna bambusides*), he said. This bamboo flowered at intervals of thirty-five years.

Y.V. retired and left soon after to spend a few months at the Madurai Kamraj University with Chandrasekharan's chronobiology group. He loved every minute of it and wrote to me that he dreamt 'of a time when a biologist would do what Raman did for Indian physics. What we need is a *Gurukul* for biology.'

The first concrete reports on masting came from retired planters and children. There were numerous stories that pigs and fowl were migrating from the villages. Something in nature was playing Pied Piper. Indian environmentalists at the Centre of Science and Environment (CSE) felt that it was a result of the defoliation operations of the new paramilitary airwing–the Central Reserve Police Force (CRPF) was using planes of the NRI airways to defoliate Mizoram.

On 3 May 1995, the *mooli* bamboo began to flower synchronically across two hundred square miles. Birds, pigs and many rodents raced in frenzied migration to the area. It was impossible to survey it. Scientists surveying the area found that fruit was raining on them, smashing their plane tables and theodolites.

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[9] D. Janzen, 'Why do Bamboos Wait so Long to Flower?', *Annual Review of Ecology and Systematics,* 1976, 7: 347–91.

The timing was immaculate. There is an internal clock in various varieties of the bamboo that no biologist has understood. It is indifferent to fire, weather or any environmental vagary. The gaps in the cycle vary with the variety. They can be as small as fourteen years, as startlingly long as 125.

When the bamboo flowers, it is the signal for a feast. Everyone loves the bamboo. Its fruit looks like a yellowish-green pear with a tender, white kernel inside. Sometimes the flowering is in clumps, sometimes the masting takes place over 95,000 square miles, though that's a remote dream today. (In the Lushai, it was like a welcome carpet flung across 200 square miles). Animals love it. Birds migrate en masse. Janzen reports of a guinea-fowl he found which had over 400 seeds in its stomach. Rats, pigs and chicken ravage the area and eat till hunger pangs become a distant fantasy. It is gluttony on an enormous scale. Rabelais would have the right words for it, not botanists. No Pied Piper could play a carnival song such as this. There have been reports of as many as 40–60 million rats migrating to a masting. All they do is eat and eat and reproduce. Nothing grows at this time for these rat populations remain in the area for two years. Rice, and even root crops like yams and arum growing in the area are devastated. Often villagers have to abandon their homes. As the rats, pigs and birds eat, their reproductive cycles shorten. It is a factory-farmer's dream as litter follows litter. For chickens, 'the pigs of the bird world', increased food consumption can lower the time of sexual maturation by fifty days. What is feast to nature, becomes famine to man, as rats, birds and pigs multiply.

Mizoram was devastated. Yet Delhi did not understand. What Mizoram faced was famine, utter stark starvation, and all Delhi offered was a committee. Committees hesitate, hyphenate, procrastinate. They never decide, and when they do, all they offer is research grants for further investigation. There were newspaper reports on the 'Frankenstein bamboo'. But it somehow conveyed an esoteric or exotic problem, something for INSA[10] or INTACH[11]. There was no sense of urgency. Worse, the response was standard.

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[10] Indian National Science Academy.

[11] Indian National Trust for Art and Cultural Heritage.

Sometimes the state is part clerk, part *bania*. It believes a quick dole of a hundred rupees closes a file and therefore there was the usual dole. The reports on the insurgency made people feel that the plague was punishment for it.

Yet all this still did not explain Delhi's indifference. Sometimes I feel that the North-East is not a real place in Delhi, it's imaginary, a fiction without real people. Only with the threat of secession did Mizoram become real, but then India behaved like the Delhi entrepreneur who has lost a piece of real estate. Y.V. was Rumplestiltskin incarnate, sending message after message. I used to send his telegrams for him. I remember one of them to Visvakarma at the Department of Environment (DOE) which said, 'Tell Delhi, the bamboos are flowering.' I felt like Byron's assistant reporting on the Greek wars. In response there was a wall of silence. A blankness of indifference. Not even reports, just one cub reporter's apologetic piece.

Henry Sailo exploited the situation beautifully. He created a Biafra/Sahel ambience around Mizoram. He did not approach any government. Just activists, environmentalists who talked of starving children. Churches moved into action with prayers for Mizoram. It was Civil Society playing on the indifference of the State. Then Sailo executed a master stroke. It was the old Bob Geldof tactic of concerts for Mizoram, with reports on the Indian indifference to the Mizoram famine. Between church concerts and rock performance, India reeled under a propaganda onslaught. It struck India where it hurt most—in *Time* and *Newsweek*. Soon after, Sailo declared Mizoram a republic. Using the Myanmar frontier, he consolidated his bases in a long arc across the lesser towns of Champhal, Serchchip, Lunglei, Saiha, ignoring Aizawl, the capital. All these places were less than eighty kilometres from Myanmar, which served as a refuge and as a source of ammunition. By July 1994, India was fighting its first official civil war.

As a botanist, I see life and death everyday, one merging into another. But guerilla war is like the madness of cancer which has forgotten all the rules and programmes. War is a voyeur's thrill, best savoured second-hand. In real life all one sees is mediocrity and terror.

I think heroism is the historian's gloss on war, and journalists, Indian journalists, are the worst historians. Have you ever listened to their commentaries on cricket or hockey? There is hysteria in every sentence as if there is a deathblow in every ball. Most of India lived the war through newspapers. Between the evening video thirst and morning tea, the audience went war mad. The media was to blame. They drove the Hindu need for the killer instinct from the sports page to the front page headlines. They wanted the MNF eliminated immediately. These journalists saw a Pol Pot in every educated peasant but did not realize that Pol Pot was actually closer to them. They wanted to eliminate populations on behalf of all the right words—the Nation, Security, Development and Progress.

The war was seen through media stereotypes down to the one unforgettable photograph. Remember the picture of a young soldier helping an old woman across the road. As he walked wiry, muscular, both exploded to bits. The picture caught the shock on the soldier's face. It was a classic before-after picture. An idiot stereotype of guerilla war, yet with all its poignancy. The picture could have been from the earlier Sri Lanka or Indian Peace Keeping Force (IPKF) files. Despite Vietnam, Afghanistan, Cyprus, Sri Lanka we remained untouched. Our old politicians never die, they live on amnesiacally.

The young Mizos hated us. All they wanted was to be left alone. 'Tell those bastards we are happy as we are. We don't want to develop. Progress is not for us. Why do you infect everyone with it? Take it all back, from the Constitution to the *Watt's Dictionary*.'

But a strange thing happened in India. Maybe it grows from the tiredness of everyday violence ranging from riot, to rape, to reservation. Maybe sanity like old age is inevitable. A civil disobedience movement shook parts of the country. Some say it began in the universities. Some say among the trade unions. But one day Lutyen's Delhi exploded with the biggest anti-war demonstration in India. It was a happy move unlike Tiananmen Square. India soon saw the unbelievable, soldiers refusing to fight. The army was tired of policing its own people. The BJP regime sought a negotiated settlement, relieved secretly to have got rid of a Christian population. Mizoram became the fourth Indian state to secede. The map of India was looking like a child's jigsaw, still loved but with many pieces missing.

Sailo and I had one last session together. Y.V. was staying with me. The Indian government was using his connections to help repatriate Indians after the war. Sailo dropped in one evening in his battered Honda. The professor was sitting deep in an old easy chair dressed in an immaculate white *veshti*, with his ceremonial *angavastram*. He was drawing beautiful pictures of vegetables for my daughter, clucking ecstatically over a piece of ginger. He patted Sailo absentmindedly. My wife brought in some tumblers of coffee and the *murku* which Y.V. loved to munch. Sailo and he sat talking in the verandah twilight.

Sailo told him about the war and what he hoped to do. It was like a student outlining a Ph.D. proposal. I realized I was jealous.

Sailo invited the professor to join the new planning commission. Y.V. smiled, amused at the idea of playing philosopher-king. He refused, telling Sailo he was an old fashioned patriot. 'I love the nation and hate the state. Also experts, experts are cancer of our lives. Drop the idea of a planning commission. Use small committees of people. We make too much of the state today. It is a big but fragile machine. We expect too much from it. We tend to see a perestroika in every reform or secession in every search for identity.'

'See this piece of ginger,' he said. 'It is a rhizome. It is not a plant in the archetypal sense with a tap root from which everything flows hierarchically. A rhizome is all connection. It is multiplicity. It connects across levels and can break your notion of well-behaved evolutionary sequences. Tribes today should be like rhizomes. The modern state is obsolete and dull. A rhizome is biology's answer to terrorism which preys on centralism.'[12] He turned to me and said, 'But India is not just bad politics, it is bad science. Remember the old adage, which historians quote so glibly. Science owes more to the steam engine than the steam engine to science. Our science was a steam engine science. It was about work and energy. We took this steam engine science and steam-rollered our world, our nature.'

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[12] See also Gilles Deleuze and Felix Guattari, *A Thousand Plateaus: Capitalism and Schizophrenia* (Minneapolis: University of Minnesota Press, 1987).

'Our science should have begun in the forest or in our fields. Instead of the engine, our knowledge should have grown around the seed, the leaf or the cow. We forgot that these were our metaphors and that is why we defoliated the forest.

'Now like idiots, we reverse comparisons. We are pleased when we say a leaf is a miniature factory. Sheer idiocy. A leaf produces food but rarely pollutes. There is no waste. Factories pollute and waste, and our science grew up blind to both. We never understood the bamboo and therefore lost Mizoram. If you want to stop secession, change your syllabi. The false frontiers begin there.'

Rao disappeared for a minute to come back with an old book. It was Edgar Anderson's *Plants, Man and Life*, an old classic. He gave it ceremoniously to Sailo. 'Botany is a gentle science. It may be a better model for government than Plato and Machiavelli. I hope you will read it.' Sailo received it with a bow, as if he had beaten me to the honours prize.

After Mizoram, I felt I couldn't study the bamboo any more. I wanted a change.

Henry offered me a job at the new Verrier Elwin Centre for science. I refused sadly. I wanted to go back to India. There are always jobs for botanists. I had two immediate options. One was to be a scientist in the Green Revolution famine areas of Punjab and the other option was in Kerala. I smelt trouble for the future of the coconut.

I am spending a stint at the Namboodiripad Research Centre at Ernakulam. There is little to do right now. Strangely, the library has a full folio of Trofim Lysenko's works. I am reading them slowly. I am also planning a children's book on the coconut. But there are still hours to fill. I kill time by writing stories.

Reinventing Gandhi

I

Myself Mohan Gangadhar Ambedkar. Yes, you wog bastards, you would have loved a beginning like that. It brands me as being separate from you effete intellectuals, wearing your English like corsets, ready to snigger at every mistake. Yet, think of it. The word 'myself' is a far better introduction than the word 'I'. 'I' sounds like a certificate. There is a certainty to the claim. It pins a person like a dead beetle but the introduction 'myself' is not a scientist's label; it is an invitation, an offering, a tentative listing. Myself like my garden, or my stamp album; the self not as a unitary 'I' but as a mosaic, a collage or a crossword puzzle. Myself, a word asking, inviting you to discover me.

My three names might puzzle you. They frighten me. I see it as a sentence, a burden of the national movement. Ambedkar was a lawyer and unlike most elite Indians of his time, those fussy Oxbridge dons, he studied at Columbia University. Gangadhar was Bal Gangadhar Tilak, archetypical Maharashtrian brahmin, the real lion of the nationalist movement before the advent of Gandhi. And my first name Mohan derives from the Mahatma.

Only in India would a man carry three crosses, the burden of three hallowed names. Only in India would a *dalit* father give his son such a name combining three rough *varnas*, bania, dalit and brahmin.

Dalit I might be, but I am also Hindu. Fortunately my father didn't engage in any neo-Buddhist nonsense. Like all Hindus I was a reincarnation and that is where my sorrows begin. I was Mohan Das Gandhi in my last life. When Godse shot me–remember, he

was one of the few Indian assassins who did not miss–I went to what is popularly called heaven. While India was free of the British, heaven was not. God was still Victorian and heaven was run by the East India Company. All those stuffed figures, with cruel eyes, those greedy barons, the clerks, the jaundiced surveyors and the lords who resided in grimy portraits, were all there. And the Lord God decided I would be born again for my sins. In heaven, as below, it is the bureaucrat who decides and the Lord's secretary was the old war horse, Sir J.H. Hutton.

J.H. Hutton was the last great census commissioner of India, enshrined in every sociologist's memory as director of the 1931 census, the last census in which caste was listed as an official category. Hutton, with a mind like a gazetteer and a heart like one, was one big filing cabinet of a man. It was Hutton who decided in what form Hindus should be reborn. It was he who decided with a genocidal twinkle that I would be reborn a dalit.

He confessed to me he was in two minds. He first thought I should be a Muslim. But Gandhi, he explained had, already borne the Muslim cross, first through that mad secularist, Jinnah, still pining for his Parsi wife, and then through his own son Harilal, who, to spite an authoritarian father became Mohammed Abdallah Gandhi. Poor alcoholic Harilal died soon after of rage and tuberculosis. Sir Hutton decreed that I was therefore to be reborn a dalit.

I was reborn a lower division clerk's son, condemned to a pune father who was mouse at office, lion at home. Very religious and a wife beater, my new father was also terribly ambitious for his sons. And I, the eldest, was his pride and my mother's too. Mediocre at school, I still passed with flying colours, thanks to an advance copy of the question papers, my father's proudest achievement. Through that happy lottery, the reservation system, I managed to escape home to the *chawls* of Bombay, and worked my way to a state government scholarship at Ohio State University.

Sadly, once an Indian, you are always an Indian. Everyone in America expects an Indian to be a mathematician, a Marxist or an accountant and as predictable. There is also the irony of a whole generation of Indian social scientists coming to America to study India. Third-rate characters these, they lack the crassness of the

American ethnographers or the confident orientalism of the British. Too meek to study America, they write commentaries on India. At least I was second rate and bored, desperate enough to invent anything, with an imagination stuffed full of American best-sellers from Perry Mason to *Garp, Catch-22* to Saul Alinsky. I was one mad salad of Americana, desperate to look at India through Indo-American eyes. My stupid supervisor, meek and forty-ish, who had served time in India on a Fulbright years ago, insisted I study the relevance of Gandhi. I was in despair. I, raised on Pynchon, Barthes, Mailer, Asimov, I study Gandhi! There is no despair akin to being imprisoned by your own history.

I fell asleep over *Experiments with Truth. Hind Swaraj* bored me. It seemed drivel, its words crystalline, regimented and boring. It read like a dull Charles Lamb to a lost Shakespearean text. I thought I would review studies on Gandhi's sexuality by N.K. Bose,[1] Ved Mehta[2] and Bhikhu Parekh.[3] But sexuality, as Masters and Johnson proved, can be dull and duller still as social science. Sex can titillate as pornography but the Mahatma wrote his sexual experiments as if he were describing a titration, pipette in hand. English, like sex, came easy to me and his experiments sounded like a dull grammar book.

Yet, through reincarnation, this man was me and was not. He was both myself and a distant horrible Other. He was me fifty years ago and yet he was all that I despised now. There was something magical in this: this man, me and not me. Gandhi was the first Hindu who laughed at fear and did not boast about it. He looked normal but was surreal. So matter of fact and yet he was a happy self-assured Artaud ready to turn India into a large experimental theatre. Utterly good, yet someone absolutely confident before evil. I remember what he said when he reviewed Mussolini's crack troops, hundreds of fascists, marching crisply un-Italian in line: 'You all look healthy to me.'

It was then that I read Robert Payne's[4] biography of Gandhi. It moved me in a way Louis Fischer's[5] didn't. Fischer's was an authentic, exact, accurate study. Payne, like many Americans, wrote with an eye to Hollywood. His *Gandhi* read like a monumental filmscript. It was alive, real, dramatic. More fruitful than the Tendulkars[6] and the Pyarelals.[7] His words are visual: you can feel yourself being dragged along to Champaran and Dandi. When you read Payne describing Jallianwala, when you watch as he describes the Salt March, your blood boils, your mind races and you feel proud, proud to be an Indian. If I were Roland Barthes I would have done a semiotics of satyagraha, shown how a pinch of salt dissolved the symbolism of Empire. Semiotics, like yeast, adds fizz to social science while statistics and surveys dull the subject. What I needed was a halfway house, something distant from number crunching but something less frighteningly esoteric than deconstructing Gandhi *a la* Derrida.

I was convinced that the tragedy lay in the fact that Gandhi as a Luddite had not read science fiction. I don't mean serious books on utopia. I mean literature, that great act of story telling from H.G. Wells and Jules Verne to Ray Bradbury. I felt *Hind Swaraj* would have been more successful as a science fiction story. Imagine if Ray Bradbury or Karl Capek had written it. I was convinced I could rewrite Gandhi, at least recast him. But social scientists are not authors. They cannot invent. They conform to George Steiner's description of the critic, that when he looks behind he sees an eunuch's shadow. At best, as futurists we write scenarios. As a saving grace, we avoid catechisms—the sociology of knowledge has taught us to do at least that. Anyway a social scientist could use the science fiction 'as if' as a heuristic to ask a question: if Gandhi were to return today, how would he redo his books, particularly *Hind Swaraj*?

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[1] N.K. Bose, *My Days With Gandhi* (Delhi: Orient Longman, 1974).

[2] Ved Mehta, *Gandhi and His Apostles* (New York: Andre Deutsch, 1977).

[3] Bhikhu Parekh, *Colonialism, Tradition and Reform: Analysis of Gandhi's Political Discourse* (New Delhi: Sage Publications, 1989).

[4] Robert Payne, *The Life and Death of Mahatma Gandhi* (London: Bodley Head, 1969).

[5] Louis Fischer, *The Life of Mahatma Gandhi* (New York: Harper & Brothers, 1950).

[6] D.G. Tendulkar, *Mahatma: Life of Mohandas Karamchand Gandhi*, 8 vols. (Delhi: Government of India, Ministry of Information and Broadcasting, The Publications Division, 1960).

[7] Pyarelal, *Mahatma Gandhi: The Early Phase* (Ahmedabad: Navjivan, 1965).

I was more confident of this exercise. I knew that if Gandhi were to go abroad today, it would not be to Oxford, London or redbrick Manchester but to a large American state university like mine. He could easily be my dorm-mate across the corridor, cooking food separately.

I decided to reinvent Gandhi using a social science format. Though flatter than a short story the social science format, I felt intuitively, would be more legitimate. A fictional Gandhi frightens no one, a social science Gandhi, even if duller, might.

I realized the wisdom of this when I saw the Attenborough video of Gandhi. There is an old tribal taboo about photographing anyone. They say filming a man robs him of his self, his soul. Attenborough did just that. When one sees Gandhi today, one sees the actor Ben Kingsley. Gandhi is more athletic in the film, more sensual. One misses the toothless imp with jug-ears, head as bald as a light bulb. Attenborough made Gandhi an athlete though the real Gandhi was a wizened sage. But I decided to follow Attenborough and Americanize Gandhi even more. By Americanizing a man, you modernize him a bit. That was the real question. How far would Gandhi have modernized himself today?

I spent the next month hurtling through Gandhi's collected works. Fortunately Raghavan Iyer had made it easier, culling Gandhi into three volumes. I read N.K. Bose, Bhikhu Parekh, Fulton Sheen, the Kumarappas, Lanzo Vasto, Paul Ricouer, Erik Erikson, Ashis Nandy and Pyarelal, folios of *Gandhi Marg*, and also looked through hundreds of photographs seeking a point of entry. It was then that I saw in Robert Payne's book a photograph of Gandhi in a loincloth peering through a microscope. It had a shattering impact on me. It reminded me of a picture I saw in a museum once, a Dali-like shot of a fried egg, yellow sun at the centre, with a crisp petticoat of white around it. At the centre of the yolk is an eye looking back at you. I felt that the Gandhi photograph was telling me something.

II

I continued dreamily with simple word associations. Mention the name Gandhi and people would say pacifist, satyagrahi, nationalist, anti-colonial, Luddite, Hindu, vegetarian and Congressman. All these descriptions are right and yet strangely inadequate because Gandhi went beyond the official or dictionary definition of each word. Gandhi was a nationalist who fought the nation-state, an anti-colonialist who wished to redeem the British, a Hindu who happily bypassed the *shastras*. He was a Congress leader who wanted to preside over the dismantling of the Indian National Congress, transforming it into a series of *seva sanghs*. He was a Luddite but the word Luddite embraces too many different people from Ned Ludd to Blake to the Shakers, and may be even the inventor of the computer virus. One word is missing in this list and that is the noun, 'scientist'. Gandhi was one of the great scientists of the swadeshi era. Of this period, three scientists are talked about and celebrated: Ramanujan,[8] the mystic mathematician, J.C. Bose,[9] the legendary plant botanist and Prafulla Chandra Ray,[10] the chemist-entrepreneur. But this list is not complete without Gandhi. Gandhi, I believe, was the most inventive of them all.

Today Gandhi would have studied science rather than law in a large mid-western university in America. His shyness, quite normal in a scientist, would still have bothered him. Instead of entering into the confines of vegetarian and feminist groups, he would have joined a radical science group. But it would not be the Mahesh Yogi variety or a Fritjof Capra-like splicing cultures into instant books. It would be something more anti-nuclear and ecological. He would have initially liked groups like John Todd's, The New Alchemists, or the Amory Lovins Institute for Soft Energy Paths or may be the Gaia network comprising of scientists like Lynne Margolis and

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[8] See Ashis Nandy, *Alternative Sciences* (Delhi: Allied Publishers, 1980).

[9] Ibid.

[10] See P.C. Ray, *Life and Experiences of an Indian Chemist* (Calcutta: Chatterjee, Chakravarty & Sons, vol. 1 [1932], vol. 2 [1936]).

James Lovelock.[11] These would have been the equivalents of Ruskin, Thoreau, Tolstoy, Edward Carpenter, the dissenting sages of Gandhi's own time. He would have wondered how his Hindu background and its hypotheses would blend with these western critiques of science, still unnecessarily pop-orientalist like Capra or bull-doggedly scientific like James Lovelock. He would have realized that physics was an inadequate basis for science and would have discarded the innumerable physical metaphors scattered defensively throughout his earlier works. He would have agreed with Aldo Leopold's claims that ecology functions at right angles to science, that it is a liminal threshold to a new niche of sciences.

In his encounter with the West today, Gandhi would have looked for a Christian critique of theory and technology. He would have been disappointed by the Billy Grahams of technology. Probably Jacques Ellul[12] is the only one who would satisfy him both as a Christian and critic of technology. Marshall Mcluhan would have sounded too facile. Lewis Mumford,[13] like his old master Patrick Geddes, would have fascinated him. Ivan Illich[14] would have been closest to him but he would have been troubled by finding Illich more Gandhian than he himself was.

For Gandhi, technology umbilicalized man, and the blood that flowed through the new cord was not love or tenderness but only the corpuscles of dependence. He would have loved Mumford's description of the space capsule as an umbilicalizing environment and seen some of the same power-dependence syndrome in the *rathyatras* of the Vishwa Hindu Parishad (VHP)/Bharatiya Janata Party (BJP) across India.

The combination of technology and revivalism resident in it would have intrigued him. In ancient times it was the king's horse

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[11] James Lovelock, *Ages of Gaia: Biography of Our Living Earth* (New York: Oxford University Press, 1989).

[12] Jacques Ellul, *The Technological Society* (New York: Vintage Books, 1964).

[13] Louis Mumford, *The Myth of the Machine* (New York: Harcourt, Brace, 1966).

[14] See Ivan Illich, *Tools for Communality* (New York: Harper & Row, 1973) and *Shadow Work* (London: Marian Boyars, 1981).

that was sent around as a symbol of power, now it is the white Toyota van, symbol of borrowed technology. The Toyota ***rath*** is dependence hidden in the trappings of Hindu revivalism. Symbolically embodying both in his person is Lal Krishna Advani, the BJP leader. While rushing through Hindu Hindi India, Advani, according to newspaper reports, found the ride bumpy during which drinking tea or any other beverage became difficult. His inventive wife, may be with a touch of unconscious irony, fitted a glass bottle with a plastic nipple. It worked perfectly. No more embarrassment of dripping, slopping tea, and suckling the bottle Advani rode to conquer India.

Gandhi would have admitted now that too much of Tolstoy had blunted his sense of aesthetics, of the purpose of art and literature in modern society. Tolstoy's question, 'What good is Shakespeare?' was too instrumental. It expected literature to perform a technological function. He would admit today that play and play alone could redeem technology.

In the America of today Gandhi would have steered clear of the world of the occult and vegetarianism. These are faddist now. Once at the time of Anne Kingsford and Annie Beasant they were archimedean points of entry into the world of the West. Bypassing even official theologians, Gandhi would have realized that it is the writers who are the true theologians. Maybe I am imposing my biases but I feel Gandhi would respond today to Ray Bradbury and Norman Mailer. Bradbury in his stories creates a world of innocence, of the blessedness of the meek. Two stories in particular would have touched Gandhi. First, *Farenheit 451,*[15] the little novella, about a world which has banned books making it a crime to possess them. *Fahrenheit 451* is the temperature at which paper burns. A small group of dissenters decide to memorize the great books and each person is known by the title or author of the book. One is Hamlet, another Hans Anderson; the third knows Tom Wolfe by heart. It is this sense of and commitment to memory that would have moved Gandhi: 'by heart' is such a beautiful coinage for memorize.

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[15] Ray Bradbury, *Farenheit 451* (New York: Ballantine Books, 1966).

Gandhi, the satyagrahi, loved to walk and celebrated walking. He would have loved Bradbury's *The Pedestrian*,[16] about a man walking, breathing in the pleasures of walking, alone in a city where every citizen is glued to the TV screen. The story ends when an electronically driven car arrests him as a dangerous dissenter. If you walk and walk alone, you might even think and act alone.

But it is Norman Mailer who has shades of the old testament prophet today. He is sensuous, angry, aware of the body and yet strangely respectful and rigorous about it. Do you remember his *Pontifications*,[17] a collection of interviews where he talks about plastic? He called plastic the perfect material example, the technological signature of the twentieth century, 'a material without any grain, any organic substance, any natural colour or predictability. Plastic cracks in two for no reasons whatsoever. It bears up under killing punishments and then explodes in the night. A fibreglass hull can go through storms which would spring a leak in a wooden hull. Then one day in a modest squall, the fibreglass splits completely. Or abruptly capsizes. That is because it is a material which is not even divorced from nature but indeed has not been part of nature.'[18]

Gandhi would have realized that technology had transformed power into a spectacle. The map of the world is no longer the cartographic division of countries, but divided according to TV channels and TV time. It is the TV screen as spectacle, as the new polis that grants identity. Without the bureaucratic trappings of an information society, a man seems nothing. Even charisma appears a function of TV. The sheer humour and charm of this came out in an incident which would have done a Heidegger or an Alfred Schutz proud.

It is the report of an incident involving an eight-year-old school boy and the former American President, George Bush. In this truly

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[16] Ray Bradbury, 'The Pedestrain', in *The Golden Apples of the Sun* (New York: Bantam Books, 1967), pp. 9–13.

[17] Norman Mailer, *Pontifications* (Boston: Little Brown, 1982).

[18] Ibid., p. 30.

phenomenological encounter, Bush goes to a small school, meets a normal child. The President introduces himself as George Bush, king of kings, President of USA. The school boy looks at the ex-CIA official and is unimpressed. How do I know, he says. Bush takes out his identity card, 'George Bush, President, USA'. The young boy remains sceptical. Anyone can get a card. If it is possible to invade a computer or sell the Eiffel Tower, identity cards of the President should be a dime a dozen. Pointing to the athletic secret agents around him does not help Bush either. They could be the rising executives of a new mafia don. Bush points to the presidential limousine outside. No impact. Any Hertz car rental agency could do better on a phone call. What Saddam Hussein couldn't do, the young school boy did: he reduced a president to sheer helplessness. President George Bush was left feeling nude outside television. It is the idiot box that provides the trappings of empire. Gandhi would have loved the story, a modern version of the Emperor's New Clothes. It would have reminded him of Churchill's label of him as the naked *fakir*, or his own comment on meeting George V, 'that the King was wearing enough for both of us'.

It is the power of the powerless that needs to be understood. Power disempowers by splitting. It is dualism that maintains power. In the West you can conquer the head or the heart: you are either scientific or religious. For instance, Dalai Lama and Mother Teresa represent compassion, Norman Borlaug or Kissinger, power and science. There is no place for compassionate power. Machiavelli and St Francis stand across a divide. Gandhi would have remembered Tolstoy's magnificent question, 'Why can't the Sermon on the Mount have the same law-like status as Pythagoras' Law?'

I confess that writing about power, after Foucault and especially Hannah Arendt, is difficult. That damned woman sipping coffee and smoking away understood power better than any man. I could happily steal a few lines from each but Gandhi would smoothly go beyond them into a world these Europeans are afraid to touch—science. Even if not a blackbox, science for them was a privileged order of discourse. In fact Europe and even the West would regard itself as barbaric or at least medieval without modern western science. If Gandhi wanted to escape the modern West, he had to subvert or transform science, playfully, laughingly and politically. But a degree in science is a bad way to begin.

III

Imagine Mohandas Karamchand Gandhi armed with a Ph.D in science, returning to be a CSIR (Centre for Scientific and Industrial Research) pool officer. American Ph.Ds in India are a dime a dozen. Fortunately, Gandhi finds a job in a small agricultural institute in Madhya Pradesh. There is nothing more emasculating than being a professional scientist in India. The magical world of science is in the West. CERN and Brookhaven are the new Vaticans or Disneylands. Our scientists need to keep visiting the West like Anteus touching the earth. Too long an exile from the West and your charm wears off. It is the West that certifies one a scientist. For the new Gandhi, there would be no period of experimentation. There would have been no time as in South Africa, no time to become a myth before he entered history, building as he did an uncritical reputation in Africa before he entered the Indian stage.

If he had lived today Gandhi would have felt once again the desperation of every foreign returned intellectual. India frightens with its size, its dirt, its masses, its corruption, its fetishization of the past, its pomposity. Looking for support among fellow scientists is futile. Trade unions just fight for promotions. The Bernalian radicals, Marxists in all shades of pink, merely want to carry science to the villages. Environmentalism is a drawing room discourse. You can talk of pollution or recycling as long you leave the worldview of science intact. Fundamentalism does not have to be embodied in a figure like Khomeini, it is present in the nature of the scientific method.

I want to answer only one question now. What would be the outlines of the *Hind Swaraj* Gandhi would have written today? Would he add science to his critiques of law and medicine? Skeletally, crudely, how would he challenge the dualism of knowledge and power in modern society?

IV

HIND SWARAJ–It reads like a child's essay. Gandhi's claim that modern civilization is wrong has the same simplicity as a child's statement that a cow has four legs. There is something clear, obvious and crystalline about the text. But read it again, try visualizing it and the whole thing appears surreal. It is as if there is a Salvador Dali lurking in Gandhi, a trickster inside the sage. A Dali and a dalit, a Salvador dalit. A dalit is important today. Without the dabit, India would turn sentimentally revivalist or crassly modernist. The search for equality is a trapeze act between the two. Equality needs modern technology. There is no greater sanity than tap water. Those who rhapsodize about village wells and *lotas* haven't lived it. Water in a tap spells freedom and cleanliness. Sanitation is both sanity and freedom. Utopian India is a clean tap in every house. Technology needs deeper thinking than Sam Pitroda,[19] our C-Dot *guru*, with that integrated chip on his shoulder can provide.

Critics have read Gandhi's *Experiments* generally in terms of four grids of sex, diet, politics and technology. Linkages are often made across columns as between diet and sex, politics and technology, but strangely there is an absence of overall connection. Gandhi's was a fluid science. Reading him one feels both a sense of tremendous consistency and adaptability, the *langue* and the *parole* of a new ethic for technology and life. The model allows tremendous free play, transformations, twists, ambiguities. There is also a shifting scale within Gandhi's text, as between lower and higher octaves. Consider simple examples.

Gandhi was against modern medicine. Even when desperately sick, Gandhi refused to take the wonder drug of his time, penicillin. Yet he unconcernedly got his appendix removed. Consider his objections to alcohol and tobacco. He led movements against alcoholism, made it part of his political platform and was uncompromising about it. Yet when it came to smoking, Gandhi was relaxed, contending it would be stopped through persuasion and pedagogy, through example. Consider again his attitude to technology. He was opposed to technology in many forms, yet acutely sensitive to it. He was ecstatic about the sewing machine. William Shirer observes that it is in Gandhi's public meetings that the loudspeaker first entered India. In fact he admits it was the first time he himself had seen a loudspeaker used in a public gathering. There is an interesting vignette Shirer sketches on Gandhi's trip to Manchester. Visiting the mills closed by the Indian boycott, Gandhi was surprised by the low quality of English machines and remarked that it was not surprising that England could not cope with Japanese competition. Gandhi criticized the iatrogeny of modern medicine, yet this same man complained to his physician Sushila Nayyar about the lack of equivalent innovation among local *vaids* and *hakims*. Gandhi helped pilot a bill of fundamental rights and he also argued that caste could not be read within such a system. This was the man who ranted against the colonial city while he always operated politically from it, whether it was Johannesburg, Wardha, Ahmedabad, Delhi or Calcutta. This sense of fluid scale gets embodied in the Gandhi-Nehru relationship. The great Luddite nominated as his successor the great modernist. The lover of Ruskin and Tolstoy chose as his successor the Cartesian Fabian-socialist, Nehru. It was not an error of judgement. India, Gandhi realized, was a Janus-faced entity. What Gandhi wanted was that the two faces should talk. He was afraid that lacking reciprocity they would become two masks stonily confronting each other. Gandhi did not deny the Nehru in him; he only wanted Nehru and his modernists to recognize the voice of Gandhi's India. I think it was in this way that Gandhi saw *Hind Swaraj*. Even in the late forties Gandhi offered *Hind Swaraj* to Nehru as his vision of India, contending he would still not alter one line of it. He implied that Nehruvian India needed two sacred texts, the Constitution of India and *Hind Swaraj*. Why?

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[19] Sam Pitroda was head of the Indian Technology Missions.

For Gandhi, modernity was a movement of forgetfulness, where secular, scientific, urban India dismissed its roots in the village community. The Indian modernist, like any new convert, knew his catechism but had no theological training about doubts, debates and controversies, the costs and pain of choice. Progress meant a

move away from the loincloth and the bullock cart.[20] More particularly, the modernist had a theory for eliminating poverty but little understanding of pain and suffering.

Poverty, for Gandhi, could be eliminated but pain and suffering needed to be lived out and understood. Not all pain was a disease or discomfort to be eliminated. If it were, altruism, restraint and asceticism, in fact love would have little play in the emerging consumer society. *Hind Swaraj* was an attempt to provide a creative unconscious for modern India, an attempt to make modernity in India more sensitive, less imitative, more confident. The Indian elite literally believed in Macaulay's statement that a shelf of western books—particularly scientific books—was worth the whole library of the Orient. Indian modernists, lacking an intellectual genealogy, adopted uncritically the ersatz pedigree of Bacon, Locke, Newton and Spencer. They thought that modernity, like rationality or formal logic, was a pellucid inheritance, with no place for pain, ambiguity or suffering. *Hind Swaraj* was an attempt to create the equivalent of this unconscious for modernity, a Gita for the modernist.

One would ask how Gandhi the scientist would have looked at tradition today. The political scientist Bhikhu Parekh provides the first part of the answer. In a thoughtful study, he stated that for Gandhi, tradition was not a blind collection of precedents, 'but a form of enquiry, a scientific adventure, an unplanned but vigorous communal science constantly tested and revised against the harsh reality of life. Far from being antithetical, tradition and science are cousins. Tradition was unplanned science and science was a tradition of unplanned enquiry.'[21] Parekh is clear and precise in recognizing the rational and empirical nature of both exercises. If he were less restrained, he would have followed up by exploring one of the grand inversions Gandhi had performed. It is true Gandhi was a scientist in his attitude to Hinduism, playfully but rigorously bypassing the shastras, ready to gently confront the

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[20] See Shiv Visvanathan, *Organizing for Science*, ch. III (Delhi: Oxford University Press, 1985).

[21] Bhikhu Parekh, *Colonialism, Tradition and Reform*, pp. 71–106.

Sankaracharya's ire. But more importantly he was a Hindu in his attitude to science, denying high church status to any paradigm or bowing before cardinals of philosophy like Karl Popper or Rudolf Carnap.

V

Gandhi was a great pedagogue. He knew the dangers of rendering any document lifeless through certain forms of mechanical utterance. It is true that in 1945 he had told Nehru that he would not alter one line of *Hind Swaraj*. But today, he would have realized that *Hind Swaraj* needed to be even more dialogical than before, that his legacy had become dull and stereotyped, more alive in Europe and America, than at home. The satyagrahi abroad had been more inventive than the satyagrahi at home. A Lanzo Vasto or a Bayard Rustin, a Luther King, an Alan Paton or a Vaclav Havel could understand the spirit of *Hind Swaraj* more than his museumized epigoni, mothballing *khadi*. It is precisely in this spirit that he would have eliminated the stereotypical opposition between town and country, a dualism that a litany of sociologists had helped aggravate further.

Gandhi would have innovated beyond his earlier critique of the colonial city as parasitic, realizing it was too defensive, too endemically biographical, the reflections of a second-rate lawyer from a third-rate town, sourgraping about London and Bombay. He would have become one of the great exponents of the city, but not the western notion of the city which treats civitas, civilization, civics and the dreams of the polis as similar mosaics. Gandhi would have tried to revive the imagination of the Indian city. Within such a frame town and country become not impregnable, exclusive fortresses but a complicity of opposites.

In fact, if Gandhi had a western complement, it was Francois Rabelais. Both were great scientists and great students of the philosophy of resistance. Both went beyond the crowd and the mob to celebrate the citizen in the city. Satyagraha is essentially a civics in that sense.

Both Rabelais[22] and Gandhi were sociologists of the body, suggesting that it was only the recovery of the body that would redeem the city. Rabelais was the chronicler of mimicry, excess, obscenity and the carnivalesque. Gandhi thrived on a celebration of limits, of a non-repressive kind. In Gandhi, the fool and the jester give way to the satyagrahi, who unlike the puritan or the revolutionary ascetic, never loses the twinkle in his eye. Both Rabelais and Gandhi linked the *polis* to the problems not only of politics but of rationality. In Rabelais, the somersaulting clown overthrows the pompous bishop and threatens the Ptolemaic world. Gandhi's construction of the body offered a different notion of politics and science. Instead of mime, laughter and parody, Gandhi talked about suffering, pain and resistance. He returned the responsibility of the body back to the victim showing how it was uncontrolled desire that allowed the invasion of the disease and the expert that followed. Gandhi seems to make suffering the site of a different kind of rationality. Science has repeatedly technologized pain and has a virtually monologic attitude towards it. In fact, pain like a slum, becomes something to be eradicated. For Gandhi pain and suffering are not merely objects to be erased or overthrown. Suffering needs languages beyond the technological. In a Heideggerian sense, it is a dwelling to be lived in and talked about. The language of resistance, of coping, must go beyond the purely technological.

The satyagrahi as citizen was also challenged by a new figure who made the Gandhian theory of the city even more imperative. The guerilla in his romantic or realist incarnations also struggled with the dialectic of town and country. In the most mechanical version, he was Pol Pot dreaming of ruralizing every city through genocide. Yet, was not Pol Pot only a more exaggerated version of the Mao of the cultural revolution who condemned or eliminated countless city intellectuals? Once the revolution is over the guerilla becomes merely an intermediate technologist offering eclectic solutions regarding the city. His revolutionary politics lapses quickly into an everyday centralism. It is the satyagrahi who has to provide the rhythm of everyday resistance, which is both scientifically and politically innovative. Gandhi would have approached this through an agricultural theory of the city. There is no sentimentalism here, no environmentalism swooning over a park or a reservation.

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[22] See Mikhail Bakhtin, *Rabelais and His Work* (Cambridge: MIT Press, 1969).

In *Hind Swaraj*, Gandhi saw the city as embodying a triangle of violence. The city was the home of vivisection, racism and prostitution. The city was also the site of the parasitic professions.

Racism violated the fundamental dignity and equality of man and the call to celebrate the diversity of bodies. Strangely, Gandhi appears weakest here. His success in Africa had a slightly hyperbolic note to it. As he himself confessed, he was uncomfortable with the *kafir* and even complained when he was confined in the same cell with them or when offered the same food. But Gandhi realized how city authorities could use planning as an aid to segregation and fought this with some success. His critique of the professions was more a reaction to what colonialism had done to the bureaucrat, lawyer and doctor, turning them into third-rate mimics of western knowledge. The rapacity of the professions had also created the city as an efflorescence of touts. It was in this context that Gandhi contended that western medicine was a form of slavery and to indulge in it was sin. Gandhi's ideas on vegetarianism, his attempt to resist modern drugs, his attempts to work out a theory of fasting were celebrated attempts to work out an alternative way of looking at the body. Sometimes they border on the obsessive. Today Gandhi would have realized that all this, while important, was not enough. *Hind Swaraj* needed to be much more inventive and provide for a more playful vision of work, waste and energy in the city.

For Gandhi, the modern city was a disembodied world, the home of abstractions and the modern machine. The dynamism of the city was not of a creative kind. The city as a site of perpetual mobility lacked memory. The city as the home of the intellectual was producing third-rate work. Recovering the Indian sources of creativity demanded that we reclaim the Indian city. For Gandhi this could only be achieved through a threefold recovery of an agricultural view of the world, a naturopathic approach to life and the concept of handicraft.

VI

The modern city dualized mind and body, *lexis* and *praxis*. Such a dualism was endemic to the modern university and its basic product, the professional. Professionalization was in a deep sense the disembodiment of the craft traditions. Gandhi's critique of prostitution was not, I would like to suggest, restricted to the oldest profession. The prostituting of professions was inherent in the mind-body dualism. The disembodied mind can prostitute itself as much as the mindless body. For Gandhi, the only way to resist the commercialization of the profession was to reintegrate mind and body. It is only such an integration that allows for trusteeship.

For this Gandhi would have advocated a return to handicraft. The Gandhian notion of handicraft is positively Heideggarian. In *What is Called Thinking*, Heidegger observed:

> We are trying to learn thinking. Perhaps thinking too is like building a cabinet. At any rate, it is a craft, a handicraft. Craft literally means the strength and skill in our hands. But the hand's essence can never be determined or explained by its being an organism which can grasp. The hand is infinitely different from all grasping organs—paws, claws or fangs—different by an abyss of essence. Only a being who can speak, that is think, can have hands and can be handy in achieving works of handicraft. But the craft of the hand is richer than we commonly imagine. The hand holds. The hand carries. The hand designs and signs, presumably because man is a sign. Two hands fold into one, a gesture meant to carry one into the great oneness. The hand is all this and this is handicraft.[23]

Heidegger adds: 'All the work of the hand is rooted in thinking. Therefore thinking itself is man's simplest and for that reason, hardest handiwork.'[24] To redeem professionalism one needs to recover this pious union of language, body and thought. It is such a piety of thinking that is embodied in the charkha and khadi.

'Round the charkha, that is amidst the people who have shed their idleness and who have understood the value of cooperation, a national servant would build up an anti-malaria campaign, improved sanitation, settlement of village disputes, conservation and breeding of cattle and a hundred other beneficial activities.'[25]

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[23] Martin Heidegger, *What is Called Thinking*, quoted in Hwa Yol Jung, *The Question of Rationality and the Basic Grammar of Intercultural Texts* (Niggata: International University of Japan, 1989), p. 22.

[24] Ibid., p. 22.

We have frozen khadi today and converted Gandhi's writings into an irrevocable shastra. Khadi and satyagraha were not irrevocable symbols, or abstract signs, but part of an evolving grammar of resistance in the concrete. Gandhi was fortunate. He entered the realm of technology as cook, nurse and weaver, not as a high-brow engineer. His theory of technology was a part of ethics and thus had a beautiful everydayness to it, a superb sense of the concrete and its inter-relationships. For him, technology could only remain technology by reactivating communitas. It is only such a notion of handicraft that can resist obsolescence. An attitude of obsolescence is endemic to the modern professional who handles equations, files and formulae as disembodied entities and can therefore easily ignore bodies and contexts. Obsolescence is unthinkable in a handicraft community. In fact, the much praised Schumpetarian innovator who rules by disruption, is a classic idiot in this context.

VII

Hind Swaraj was a major critique of the professions. But the one profession that Gandhi ignored would become central in any rethinking of the book. Today, a Gandhian epistemology of science would be necessary. Such an essay is beyond my abilities. What I will explore however is how Gandhi would have altered the organization of science.

Gandhi was at once a sage and a baniya. It is precisely these avatars of his that would become the pair of scissors pruning science to size. It is as a baniya that Gandhi's critique of science would have been more devastating. No baniya stifles work even as every baniya is ruthless about flabbiness and waste. And in criticizing science, Gandhi would have joined Jim Lovelock in feeling that 'science had grown fat, lazy and corrupt and like an obese athero-sclerotic man [who] imagines more rich food will cure his condition'.[26] When money is a vocation, one husbands it. Also one is inventive with it. Gandhi would have realized that what science needs least is money. What it requires is a more playful asceticism, a catalytic shift whereby from being a career science returns to being a vocation.

Gandhi would have added with that other great baniya, James Lovelock, that 'no annual report ever asks how many students enjoyed work, how many children visited a laboratory, how many students functioned as willing apprentices'.[27] Transferring this playful asceticism to an Indian context, Gandhi would have asked for *ashrams* and *gurukuls* in science. It is *gharanas* and gurukuls that can encourage scientific genius, provide the scientist with the tacit knowledge that makes for creativity. In fact only one modern Indian scientist, C.V. Raman, successfully created a nursery of Indian scientists. Raman was cantankerous, authoritarian and unbearable but he eventually encouraged more creative scientists than the entire CSIR which he dubbed as 'tombs for the burial of scientific instruments'.[28] But what Raman grumbled about or ranted against, Gandhi would have formulated more systematically.

His suggestion in a Lovelockian fashion would be for the dismantling of all large laboratories. Gandhi would demand that the scientist work at home. Based on the political economy of research he would make four other arguments. He would contend that science like medicine was becoming increasingly iatrogenic. Gandhi would add that to practice western agriculture like western medicine was slavery and that the peasant was as responsible as the agricultural scientist for the ecological havoc of the Green Revolution. He would add further that the solution to the problems of science was not more investment in science. Science in its present form was subject to diminishing returns. In the Piercian sense of fin-de-siecle physics once a paradigm gets entrenched one needs more

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[25] Quoted in Sunil Sahasrabuddhey, *Science and Politics*, (New Delhi: Ashis Publishing House, 1996), p. 27.

[26] Quoted in James Lovelock, 'The Greening of Science', *Resurgence*, no. 138, January/February 1990, p. 12.

[27] Ibid, p. 16.

[28] See Visvanathan, 1985, ch. IV.

and more investment to solve problems of diminishing intellectual viability. Gandhi's idea would have stemmed more from medical research. Here every cycle of drugs invented tends to be more cost-intensive and less effective than its predecessor. Hence cost-effectiveness/prudence necessitates that the patient (or the farmer) accept responsibility for illness and strengthen the body (or the soil) against the need for drugs (or fertilizers). The political economy of modern science demands that every man become a scientist and every village or city a science academy.

Gandhi was not a philistine. His calipers for measuring science were not those of relevance or productivity, the obsessions of the science policy expert and the mission-oriented laboratory. He would have met science at its own level by contending that the goal of science was creativity and then contended that modern organizations showed little evidence of it. A community should be judged 'by the number of cranks, eccentrics, mystics, inventors it has'.[29] A mission-oriented laboratory is hardly the place for ensuring the survival of such a species. But at the same time Gandhi would have suggested that the scientific credo of idle curiosity as an abstraction would not do. The solution to the dangers of idle curiosity is not abstract, ivory tower science. It is to return science to the community, where one interacts with everyday questions ranging from the mundane to the esoteric. When theories, like khadi, are spun at home, science would not be just abstract problem-solving. Nor would relevance be ordained by the bureaucrat. The scientist would care, heal, preserve, nurse and realize that there is an inventiveness to maintaining, preserving and preventing. The community of science would vary from city to city, village to village, studying plants, the sky, forests, wood, seasons, stone, houses, flowers, soil, tools. Yet each community would add to the ocean of alternatives. Gandhi would have loved a passage from James Lovelock's John Preedy lecture, of a vision of science as 'lean and fit, as tough in mind and heart as the nurses of Florence Nightingale's time'.[30]

[29] Lovelock, p. 13.

[30] Lovelock 'The Greening of Science', p. 16.

But a science pruned by the baniya's eye alone will not do. The sage in Gandhi would see it as incomplete. Prudence is not enough. What one needs is the notion of a sacramental science which can save nature. Gandhi would suggest that the sage become an intrinsic part of the experiment. After all he took his experiments on himself seriously. He would have realized that every sage is a laboratory, that his experiments on himself can provide valuable insights for other people. Here the notion of the sage is closer to the shaman than the doctor. The sage, because of his discipline, is trained to amplify his consciousness. His forays into the body can provide new insights and then medicines more delicately attuned to it. It is this process of self-testing that would have appealed to Gandhi, where the initiate rather than an innocent guinea pig becomes the source of insight. By doing so the sage adds two new elements to science. First, the ethical and cognitive dictum that the physician as sage should experiment on himself. Second, by relying on his dreams, his subjective experiences, the sage adds to empiricist testing, the idea of revelation. The scientist becomes part shaman in his search for understanding.

Despite or may be because of the Jain elements in his philosophy, Gandhi was never sentimental about nature. He would have realized that most forms of work involve some violence to nature but one must seek to minimize it. If the theory of handicraft constitutes one aim of this, his naturopathic perspective constitutes the other. Possibly because of the influence of Kuhne, his experiments in vegetarianism, and the experience with theosophy, *Hind Swaraj* is written as an intensely naturopathic document. Essential to naturopathy is the idea of harmony. For Gandhi, the body was a microcosm of the universe and he sought a harmony of two kinds: the harmony of the body and its constituent parts and of the body and its environment, particularly earth, water, light and air. All disease is a violation of harmony. In naturopathy, one strengthens the body to resist disease. The healer is one who recognizes the wisdom of the body rather than rely on the all-conquering drug. There is no greater violation on the body than clock time. The modern city and the modern idea of work adds to the stresses that disrupt the harmony of the body, the soil and the cosmos. The natural rhythms of life and death go to strengthen the soil, thus avoiding synthetic fertilizers.[31] The idea of organicity redeems the mechanomorphic city. Limiting desire restricts technological rapacity. Naturopathy, like traditional agriculture and handicraft, builds into the system a sense of limits, of what one can do and do no further. It is this sense of limits, of responsibility, which no modern system of knowledge possesses at the epistemic and ethical level.

Gandhi had shades of the Zen master. In that peculiar twist, he would have claimed that what the sacramental requires is a grasp of the excremental. Gandhi's writings repeatedly emphasize his preoccupation with cleanliness. He claimed that toilets should be clean enough to eat in. In another instance, he stated that the only thing India needed from the West is a drainage system. It is the sewer and the flush tank that made the modern city possible. But today Gandhi would realize that the modern flush tank is one of the most wasteful and retrograde machines known to man. It is symptomatic of modern industrial life where waste is seen as an externality.

It is interesting to note how the *Oxford English Dictionary* defines waste. Waste is a term used to refer to any space which is barren, uncultivated, untouched; all these are wastelands. Waste is also used to refer to any object which has been overutilized, to describe any thing which has been sucked out and abandoned: what has been destroyed by overuse is labelled irrelevant. The term waste also refers to decaying or dying objects. So the concept of waste falls at opposite ends of the spectrum of 'normal' life, between the underutilized and the overextracted, between the untouched and the untouchable.

Gandhi would seek to redeem an agricultural view of life by restoring waste as the central category in any system. Waste conceals under that general rubric various forms of life. In fact one has to show that there is no such thing as waste in nature, that what is called waste is part of a phenomenally complex food chain.

Secondly, it forces us to look at the cultural construction of waste and the forms of violence it might hide. Once the category of waste is unravelled we discover the multiple forms of life present in it. It includes shit, rubbish, dirt, snot, sweat, junk, refuse, garbage, scum, pollution, obsolescence. Modern economics, which is constructed around the axes of scarcity and waste, condemns whole life-worlds with this glossary.

Gandhi would seek to redeem both modernity and tradition by focusing on waste. He would make the scavenger the paradigmatic figure of modern India. Automatically, the brahminic world of Indian science would receive a shock. But the threat is not only to the status hierarchies of the system. For Gandhi argued that waste has not been fully thought through by city science.

Modern science by overfocusing on production has not celebrated decomposition, the reduction of manufactured goods to their original materials. If the notion of biodegradability had been celebrated, we would not have cars and abandoned plastic containers in junk-yards, let alone nuclear waste. The modern consumer too is a big mouth who forgets his even bigger anus. It is in this context that sewage rather than becoming a source of pollution would become a source of life and work. The classic example of city sewage use is Calcutta. This much maligned city uses its sewage to grow its finest vegetables.

It is in this context also that fermentation, the great folk science of Asia, as central to food as to garbage, must recapture the imagination of any third world science. The idea of bio-conversion also provides a pluralist touch. It is modest, local, culture-specific yet it does not preclude sophistication of analysis or thought. By focusing on waste, the city sciences of today can recover an agricultural view of the world.

Probably the way to understand Gandhi today is to ask how he would have looked at the Narmada struggle.

[31] See Albert Howard, *Agricultural Testament* (New York: Oxford University Press, 1943).

VIII

More than Chipko and Bhopal,[32] it is Narmada that could represent one of the great moral struggles of our time. Chipko emphasized the necessity of seeing green but somehow lost its importance by becoming a rorschach for environmentalists who saw in it everything from subaltern politics to alternative science. Bhopal had possibilities as it raised questions of a peoples' science movement but stopped there, enmeshed in the labyrinth of litigation. Narmada, however, can link issues of cognition, survival and democracy. Yet, strangely, the struggle is seen as primarily a local problem today.

Within the media, the struggle against the proposed dam centres around two figures. The first is the stark figure of Baba Amte. Recipient of the Magasaysay Award, Amte is a legend for his work among lepers. Baba Amte seems to have subconsciously realized that dam oustees are among the lepers of development, stuck in limbo between land and market, between a world they have lost and a world they may not enter. They are never fully rehabilitated. Even when land is offered for land, it is either degraded forest land or worse. If the compensation is paid in money, the aftermath is as traumatic. The no-dam position is not extremist; it is the logical position of a people driven to extremes by a state that has never systematically rehabilitated oustees.

The second figure is Medha Patkar, who represents a slightly different position. Patkar captures the limits and possibilities of voluntary group politics. If Amte's is an ethical position (he has built his hut on the territory to be submerged and has sworn he will die there), Medha's is a more political stand. Apart from these two remarkable individuals, the accompanying bevy of environmentalists, journalists, human rights activists do not really spark the imagination. They appear less convincing than even Sanat Mehta, who, General Motors' style, virtually contends that what is good for the Narmada dam is good for Gujarat and India. Despite the international concern, despite the media attention, the anti-dam struggle has failed to move India as a whole, splitting up into a series of eclectic or esoteric debates. The fate of the uprooted has left the nation indifferent.

For Gandhi, this failure would have been a twofold one. It is firstly the failure of the ethical to be convincingly political. The Narmada protest seems amateurish or ineffective with the tribals resisting the dam appearing like a bit show staged by INTACH. There seems to be a lack of rhythm between the leaders and various voluntary groups. The protests in Delhi seem a ten-to-five affair. The use of Medha Patkar's fasts as a political weapon seems woefully inadequate. What is worse, the Narmada rarely seems to bother the scientific or middle-class imagination. It seems a throwback, an antiquarian piece of resistance. Basically neither the cognitive nor the ethical levels of the debate have entered into and transformed the political imagination. Mahatma Gandhi would have seen in the Narmada struggle perfect possibilities of theatre. But the language of such theatre must capture the pain and the voice of the victim. This is lost in the language of modernity, secularism, progress and cost–benefit. An accountant's ledger or a consultant's report cannot be a mourning ritual.

Gandhi would alter the language of such a debate. The damming of the Narmada would be an act of sacrilege and undoubtedly ecocidal and genocidal. What adds to the obscenity is that murder is justified as an act of consumerism. The plaintive comment 'what about electricity?' is the moral equivalent of the defence of the Emergency dictatorship on the grounds that the trains ran on time then.

Gandhi would have rescued religion from the fundamentalists, contending that the real sources of the sacred are forests, mountains and rivers rather than the Ram Janmabhoomi. Conversely, to think that the Narmada or the Ganga can be saved by an environmental board or a hobby time INTACH is also inadequate. It is the Narmada as a river that captures the unity of India, of cultures—Hindu, Buddhist, Muslim, and of ecologies that have existed side by side. All this is living memory. But it fades when the Narmada merely becomes a fragment of a dam project, a piece of ersatz

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[32] See Shiv Visvanathan, 'Bhopal: The Imagination of a Disaster', *Alternatives*, 11(1), January 1986.

history called 'development': it becomes a victim of what Mumford has called 'the myth of the machine'.

Maybe like bad magic there is bad myth—myth that is not life giving, whose rites are not festival, whose violence conflates vivisection and sacrifice. In such a regime you need the machine and the ideology of progress; its calendars don't celebrate life cycles and seasons. All it marks are conquests and revolutions. What a strange word, revolution. It does not connote a full circle, a return or a rebirth. A revolution in history does not revive. It erases. A dam promises a revolution. Once a river is 'developed' it is no longer memory. It is merely power for irrigation, it is cusecs of water. A dam desacralizes and desemanticizes a river. The Nile was never ***the*** Nile after Aswan. A dam is an act of reductionism. The river no longer flows, it is harnessed and 'made to work'.

A river is not merely a physical resource. Like tradition, it is a commons of memory, a weave of different forms of life. Seeing the river as only a resource disembeds it, abstracts it, and instead of worshipping the river, we worship the dam on it. The sadness began with Nehru. Long after the idiot religion of Comte had been abandoned, Nehru revived it by calling dams and laboratories the temples of modern India.

To recover the Narmada we need myth and sacred geography. Gandhi would not have argued merely from statistics and survey maps. Body counts of development can be as pathetic as body counts of war. Gandhi would have become a pilgrim, doing a *parikrama* of the river. By retracing its course, one remembers the worlds existing side by side. It is this sense of the river that Nehruvian development has destroyed. The story of the river shrinks to the moment of the dam. Sacred geography, tradition and myth yield to secular spaces and the economic map. Destroying the river at the level of production, the tourist, no longer a pilgrim, consumes what remains, through leisure.

Gandhi would have ignored the consultant's report or the World Bank assessments and interpreted the Narmada struggle as a new *Mahabharata*. It is here that town and country, Gandhi and Nehru, critical tradition and progressive modernity come to battle. It is around Narmada that Gandhi would have restarted his struggles against modernity. His tract on the Narmada, as the centrepiece of a transcreated *Hind Swaraj*, would literally be a Gita of anti-development.

For Gandhi, a dam was only a reified expression of modern economics and modern science. He had confessed he had not read Ricardo and Adam Smith and added that he was not bothered about it. Unlike Nehru he would not need to import consultants from the first world, be they Blacketts, Bernals, Kaldors or Joan Robinsons. Nor would he require short courses at the World Bank or Harvard to run the economy. (Not that he was averse to foreigners. Only he would encompass them within his dream. After all, he collaborated with C.F. Andrews, and the Polish engineer Maurice Frydman did design his spinning wheels.) Being a shrewd sage, he realized that modern economics was either *ego-nomics* or *ergo-nomics*. It dealt with the obsessions of the bloated maximizing individual self or the gargantuan collective self—the corporation or the state. Or it was the idolatry of efficiency which repeatedly invented scarcity or the myth of efficiency to justify expansionism.

Central to any alternative manifesto would be Gandhi's attempt to recover the moral economy of waste, work and energy.

For Gandhi, modern work no longer seemed about livelihood and living. It is seen as abstracted and separate from man, measurable as output, analysable as a science. What is even more pathetic is that nature is seen either as not working or working badly. The consultant's reports on the Narmada see the river and the surrounding forests as lazy workers producing wood and some minor forest produce.

There are shades of Victorian discourse in these technocratic texts. It is not the usual observation of nature as a resource to be mined or a woman to be raped. It is a more disturbing sense of nature itself. Nature, especially tropical nature, is constituted as excess. There is a sexual corsetting that needs to be touched upon. For the economist, nature as river, nature as water, needs to be 'harnessed'. Mere flow is excess. It is the indecency of spill-over. Excess pollutes or wastes and therefore it must be bound. So nature as seed, as forest, as river is bound and stored in banks, in reserves, in dams. There is a disciplining of nature here. Nature as a reproductive process is being forced into a productive discourse.

But it is a myth that nature does not work. One constantly hears that it is the dam that is going to produce but nature is always working and nature is playfully efficient. Gandhi might have quoted Felix Paturi's fascinating table:

> Every year terrestrial plants store 17,200 million tons of carbon, marine plants as much as 25,000 million tons. This total of 42,200 million tons of carbon is contained in 105,500 million tons of glucose which corresponds to a goods train 30 million miles long filled to the brim with glucose. It would be long enough to cover the entire railway network of the world 40 times without break. It would be 130 times as long as the distance from earth to moon. This train would contain the glucose production of one single year.[33]

Imagine if this were the production of our public sector plants or of a multinational or a collective farm. It would be on the news, touted with the modesty of newspaper supplements on Stalin or Kim-Il-Sung. But when 40,000 hectares of forest land gets submerged at Narmada, the experts do not mourn. They see it merely as loss of timber and minor forest produce to be written off.

Nature's economy can never be caught in the present categories of political economy or market economics. The work of nature and the economists notion of work are incommensurable. The work of a large dam and the life-world called the forest are incommensurable domains. It is in 'accounting' for the latter that the sage and the baniya in Gandhi would have striven for.

Gandhi would have simply stated that all work is a form of caring. Nursing, cooking, weaving, these are forms of caring. You tend, you cultivate, you grow, you weave, you spin. All these are forms of touching and touching gently. Today, work has lost its gentle metaphors. We mine, we excavate, we bulldoze, we dam, we harness, we exploit. Work has become a form of disciplined, professionalized violence organized within the framework of brute machismo, puritanism or abstract technique.

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[33] See Felix Paturi, *Nature, Mother of Invention* (London: Thames & Hudson, 1976), p. 15.

This is partly disguised by the western idea of energy. The modern thesaurus of energy is short and bleak because energy like the western concept of God is monotheistic. It is incarnated in the calorific notion of work and efficiency. This notion of energy provides for a simple but gigantic idea of power. When energy becomes an index of progress (the new sign of grace), the state becomes a big machine for the control of energy. A mechanistic notion of energy seems statist, while biology generally seems on the side of civil society. All attempts at returning to small scale have been biologistic.

Unfortunately, the age-old relation between energy and the state is present in Narmada. In fact Gandhi would show that the challenge to the dam is a challenge to the state. Otherwise why proscribe protest at the Narmada under the Defence of India Rules? If the dam goes, the state, or at least the current model of the state, may go too. When we cease to worship dams, the cult of the state may itself disappear. Smaller dams or tanks might mean a less powerful state or a more revitalized civil society. What Gandhi would have challenged through the Narmada is the fundamentalism of state power embodied in rituals like large dams and reactors. And it is precisely in this context that he would show that what was missing in the Narmada protest was the politics of knowledge. He would have added to the Patkars and the Amtes, someone like the scientist C.V. Seshadri.

Seshadri, like a playful Gandhian, would show that the western notion of energy, its concept of efficiency and power, is based on mechanical work done at high temperatures and gaseous states. It is modelled on the heat engine, the harbinger of modern industry. The question such a framework asks is how to obtain work at high temperatures. Secondly, its focus is on a special kind of work that can be harnessed by the market and the state. It is anchored to a parochiality that does not realize that many important processes in the world take place at ordinary temperatures and in liquid and solid states. However, once we accept the official scientific notion of energy, certain decisions follow.

Agriculture will only be improved through high-yielding seeds and synthetic fertilizers produced by the high temperature Haber-

Bosch process, shifting the control of seed and fertilizer to the corporation and the state. Similarly, once a forest is visualized in terms of modern energy markers, its multiple use as food, fodder, medicines, dwellings, myth, play is lost or devalued. The forest becomes a raw material for the energy guzzling paper industry. Simultaneously, the notion of the forest itself changes, as monocultural strands of eucalyptus plantations are regarded as moral equivalents of a traditional forest. With such a notion of work, renewability also becomes a problem as emphasis shifts to fossil fuels which require millions of years to renew themselves. So too with a dam. When a river is seen purely as cusecs of water for electricity and irrigation, the traditional notion of the river as a great chain of being, as a dwelling, as a source of food or work, disappears altogether. What Seshadri through his concept of *shakti*[34] suggests is that the modern concept of energy like money dissolves ecologies, and destroys wealth as other cultures see it. What Gandhi might add is that the notion of energy which is so monolithic needs to be reworked into a pantheon of concepts, by breaking energy into a *parole* of meanings. From the one universal *energetika* or the abstract energy index of planners and economists, it must break into a polyphonic sense of energy symbols. Energy must become carnivalesque as pidgin energy, mixed metaphor energy, misspelt energy. Such a notion of energy is present in Seshadri's search for an alternative idea of energy, shakti, but the search is not merely to replace one God with another. It is to multiply energy into a number of village deities, with innumerable concrete powers varying from niche to niche.

Gandhi would show that the Indian state itself had thought of such a move. In the era of Indira Gandhi, two outstanding scientists, Hussain Zaheer and A.N. Lahiri, of the Central Fuel Research Institute at Dhanbad had advocated that India shift its industrial base away from petroleum. Zaheer had suggested gasification of coal as an alternative. Gandhi would suggest that the entire civil society must participate in this project through acts of prudence, through bits of local inventiveness, through restricting want and multiplying the renewable sources of energy. Within such an effervescence, the somnolent indifference to the Narmada project would not be possible. Years ago, just prior to the Emergency, Jayaprakash Narayan asked the police not to participate in the atrocities of the state. Today Gandhi would ask the scientists not to participate in projects devoted to petrol and nuclear energy. He would in fact articulate a call for a civil disobedience movement in science, where scientists join the Amtes and Medha Patkars in showing that the proposed Narmada dam is scientifically and politically obscene. The first of these dissenting groups would be sustained by local communities. Years ago, during the national movement, it was money collected during the Ganapathi festivals under the leadership of Tilak that helped the Paisa Glass fund, which pioneered the glass industry in India. Today this same spirit of Swadeshism should sustain the Satish Dhawans, the Jayant Narlikars, the Siddiquis, the Seshagiris, the Kalams, the Amulya Reddys, the Visvamitras, the innumerable younger scientists–if they choose to move out of the laboratories.

In fact, the Narmada should become the equivalent of the Salt March, dissolving the new empire built around the state-science nexus. It is around the protest against the dam that a whole series of new co-operative programmes must begin: a new model of decentralization, a revival of traditional forms of irrigation and their improvement, community action to resist soil erosion, the possibility of making forests into autonomous communities, of creating new ways of science outside the corporation and the laboratory. Such an effort would also break the undialogical nature of the current struggle.

Any struggle, while emphasizing resistance, must never lose its dialogic power, a dialogicity which appeals, embarrasses, questions, offers alternatives and eventually redeems those in power. Such a struggle disables the clichés of the Indian middle class which sees science as God's truth and the bureaucratic file as divinely ordained. The alternative exists, the vision is being lived out and the struggle begins not at Harsud, the town doomed to die because of the dam, but within everyone. Gandhiji once said: 'They say that

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[34] C.V. Seshadri, *Development and Thermodynamics* (Madras: AMM Murgappa Chettiar Research Centre, 1982).

control over the hidden forces of nature enables every American to have 33 slaves. Repeat the process in India and every Indian will be 33 times a slave.' The struggle against the dam is not an appeal to preserve and museumize; it is a call to invent, maintain, adapt. There is no need to fetishize the charkha. If khadi symbolizes cooperation and communitas and if these can be built around another symbol, so be it. It is around the Narmada that the new festivals of politics and science can begin. But one must realize that effervescence alone is not enough. The everydayness of resistance must continue till a new culture emerges and words like World Bank, transfer of technology and nuclear waste sound like distant echoes of a lost or forgotten civilization.

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